

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

MAY 2, 1955

50 CENTS

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There are two others like it in operation. And all three are in our Aero plant. The new winders are capable of winding the finest wire with an accuracy hitherto unknown, faster than ever before. In fact they can wind wire finer than any now made.

A good example of what this means: number 50 wire was the finest used for potentiometers. It has a diameter of $1/1,000$ inch ($1/4$ the thickness of human hair). The new coil winders now can handle wire $2/10,000$ inch in diameter.

Particularly important to Honeywell Aero is the new machines' ability to make better potentiometers possible.

Potentiometers continue to be the best signal source for a number of vital control systems. Our ability to make more sensitive, smaller and precise potentiometers than ever before will be reflected in more sensitive yet economical precision control systems for aircraft and missiles.

The new coil winders represent another important contribution to airborne controls. There'll be more, because controls are important to aviation's progress—and automatic controls are Honeywell's business.

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Aeronautical Division



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Kaylock nuts are also available in sizes for smaller and smaller and are available in standard production in full endurances with the B.F. Goodrich standard line AR-100 and AR-101.

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RESEARCH NEWS

B.F. Goodrich

FIRST IN RUBBER



Navy lands new 75-ton Lockheed R7V-2 on B. F. Goodrich wheels and brakes

DESPITE 75 tons of take off load, the Navy's new R7V-2 "Super Goose" cruises at 440 mph. The problem was to get her down *gradely*, stop all her weight and speed quickly. What solved the problem? The B. F. Goodrich wheel and brake design that exact superior efficiency ratings on heavy bombers, logistic airplanes.

B. F. Goodrich brakes took the Super Goose down fast because they operate on a highly efficient principle. Here's how simply too B. F. Goodrich principles work.

When fluid pressure is introduced, a full circle "rub" expands radially, applying the pressure to brake blocks around the full circle of the drum. This lifts each brake block evenly and instantly with rapid braking piston. It results in heavy load drum drives on the landing gear even when, longer during braking. When pressure is released, strong return springs insure positive clearances—fast!

The B. F. Goodrich wheels on this Lockheed Super Constellation are made of lightweight alloy. They give three extra strength without added

weight. They passed the 300,000 lb. axial load test.

B. F. Goodrich De Krom and fast rolls were also chosen as standard equipment for the R7V-2. Other B. F. Goodrich products for warbirds: tires, heated rubber, Pressure Sealing Zippers, Arrows, adjustable seats, Kevlar, low and accurate. Write The B. F. Goodrich Company, Akron, Ohio, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



Martin's new XP6M is a radical departure in aircraft design. It features a narrow, streamlined fuselage and its engine nacelles strap the wings. Four Allison T-31 engines with takeoff effectiveness over the 3000 hp will power 400 mph and in all cases of over 40,000 feet. Clifford amplifier is shown at right.

Martin XP6M's Cockpit Temperature and Anti-icing Controls Have Novel Features



New Clifford system employs lightweight control box with unitized construction, miniaturized components, novel pulse element, and unique skin temperature sensing elements.

In addition to its small size and light weight, Clifford's new control box design embodies several important advantages in service. Unitized construction makes it comparatively simple to locate a malfunction in service, quickly replace the unit containing the defective component, and get the plane back into the air.

Miniaturized, ruggedized components result in the smallest, lightest control possible for the job to be done. Elements within the box comprise an amplifier, which is highly compact and put in resin, a novel pulse element smaller and lighter than comparable units, slave relays to operate valve actuators, a power supply, a calibration unit for the electrical bridge, and a radio noise filter.

Physical and electrical designs are both powered with the performance-in-service factor. Electrical input valves are held to optimum levels to insure long trouble-free service. Physical arrangement of parts promotes maximum ease of inspection.

New skin temperature sensing elements, smallest such units ever



made, are fastened to the skin to insure close, accurate sensing and control and protect the P6M against icing hazards.

Complete system of Clifford design and manufacture encompasses temperature sensing elements, temperature selector, and control box. On the P6M, wing and tail anti-icing systems are centralized with a common control box. The cockpit temperature control system is entirely separate, having its own control box, sensing elements, and associated high temperature air valves.

Information or centralization involving temperature control systems custom-built to the requirements of specific aircraft on which you may be working is available without obligation.

Write: Clifford Manufacturing Company, 138 Grove Street, Walpole 54, Mass. Division of Standard-Thomson Corporation. 7-14



ROYAL AIR FORCE HAWKER HUNTERS (cocked roofs up to 600 knots (594 mph) during this flight, fastest formation of British aircraft by RAF pilots. First delivery to NATO of the Mark 4 Hunter arrived recently at an RAF base near Wiesbaden, Germany.

Domestic

Deputy Aircraft Corp. apparently is developing a helicopter civil transport along with its jet-powered DC-3 and expects work will be in active service by 1960. "Since we can't construct both at once," said President Donald W. Douglas, "we are trying to determine which to undertake first." Meanwhile, the first production DC-78 made its maiden flight at South Plainfield, N.J., and will be delivered to Pan American World Airways late this month (see p. 86).

Eastern Air Lines' stockholders approved the acquisition of Colonial Air Lines last week by a vote of 1,264,375 for and 8,031 against. Major agreement was receiving Civil Aeronautics Board approval, calls for an exchange of one share of EAL stock for two of Colonial.

National Airlines lost its suit for a court injunction against construction of the Port of New York Authority's proposed Terminal C at Idlewild International Airport. NAL filed the suit in New York State Supreme Court in an attempt to force PNTA to give the airline a site comparable to the space it now occupies.

Sperry Gyroscope Co. reported its annual sales at Lake Success, N.Y., last week after securing success in International Union of Electrical Workers (IUEW) got up trying to block the laborer's fight on non-striking grounds. The win was called Apr. 22 to last, the union's demand for an 18-hour-a-week wage increase.

Called world field base will be built by Lockheed Aircraft Corp. at Cape Canaveral, Fla., auxiliary of USAF's long range missile test facility

at Patrick AFB. The base, Lockheed's second, will supplement one now operating at McDonnell Air Development Center, N.M.

Edison Manufacturing Co. purchased Prudhoe Plastics, Inc., and will operate the North Tarrytown, N.Y., line as a subsidiary. Formed in 1948, Prudhoe designed and developed gas turbine aircraft powerplants and manufactured instruments, controls and engine devices.

Griffin-Wright Corp. plans to build a new research, development and test facility in central Pennsylvania for advanced aircraft powerplants and other projects.

U. S. Hydroplane expects total 74 aircraft valued at \$1,000,188 during March, keeping the number of aircraft so far this year to 164 worth \$2,852,285.

Joseph C. Towle, 46, director of flight operations at Lockheed Aircraft Corp., died last week at Burbank, Calif.

Financial

Boeing Airplane Co.'s net profit of \$6,890,846 for the last quarter of 1955 compared with \$5,575,000 in the first three months of 1954. Sales dropped to \$108,560,000 from \$265,460,000.

McDonnell Aircraft Corp., St. Louis, had \$7,194,000 in earnings after taxes during the nine months ended May 31, exceeding from \$2,754,000 for the same period last year. Sales were \$109,270,000, compared with \$95,115,000. Booked May 31, \$119,072,390 against \$91,372,800 on June 30.

Gloss L. Martin Co., Baltimore, reports net profit of \$2,112,000 for the last quarter of 1955, a decrease from

\$2,497,800 for the same period last year. Sales increased to \$68,410,000 from \$70,513,000.

United Air Lines' first quarter net profit totaled \$166,000, pushed into the black by a record volume of traffic (AW Apr. 15, p. 124). The profit compared with a loss of \$1,070,000 for the same period last year. Revenues were \$78,181,000, booked above the \$77,714,000 for 1954's first quarter.

Flying Tiger Line expects contract operations for the second quarter of 1955 to exceed \$2 million, 25% higher than the first three months' \$1.6 million. Largest contract is a USARF award for seven legs per month through June under the new global aerial logistics system (AW Feb. 21, p. 13).

American Airlines will pay a regular quarterly dividend of \$8.875 at a 5% cumulative noncumulative preferred stock June 1 to holders of record May 16.

Ross Aeronautical Co., San Diego, declared a 10 cent dividend on common stock, payable June 10 to holders of record May 20.

International

Prototype Canaville S. E. 230 began ground tests at the Bourges plant at Bourges, France. First test flight of the transport transport is scheduled for June 15, coinciding with France's International Air Show at Le Bourget. Powered by two Rolls-Royce Avon RA. 16s, the cruising speed is estimated at 590 mph and payload at 71,000 lb.

Trans-Australia Airlines has carried more than 50,000 passengers in Vickers Viscounts since the first of TAA's four turboprop transports went into service Dec. 18, 1954.



John F. White, President of Aero Design Engineering Company, San Francisco



R. W. White, Vice President of Aero Design Engineering Company, San Francisco



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AERO DESIGN
Commander

NATION-WIDE

**SALES AND SERVICE
ORGANIZATION**



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AERO DESIGN
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Washington Roundup

AIA Ducks Honaman

Aircraft industry is exercising extreme care to shield itself from involvement with R. Earl Honaman, Defense Department's new deputy assistant secretary, who is known to down on production of much unclassified information (see p. 27). Honaman's position comes from the Office of Strategic Information at the Commerce Department, where he was deputy assistant secretary for the past two years. He was asked to resign after a report that he had been involved in a "cover-up" of the 1964-65 Vietnam war. Honaman's position at the Commerce Department, Honaman said, was to lead him a representative firm in aircraft support for about a year on virtually a full-time basis. AIA's Public Relations Advisory Committee, composed largely of aircraft executives, rejected the invitation.

Cargo Lease Opposition

American Airlines is spearheading the scheduled transport industry's opposition to the Navy's proposed program for leasing available military cargo aircraft (DOD 1450) to commercial operators. American objects to the program that a Navy leasing arrangement would be making some other aircraft program of the "military" nature of the "military" concept, which has been repeatedly rejected by the Congress.

Earlier that time the Navy, before the Air Corps leasing Committee's meeting on the proposal, American went to Congress Secretary Sander Weeks over the head of Louis B. Rockefeller, NDC chairman and Under Secretary of Commerce. A direct protest was lodged with Weeks to the effect the government was to be going two ways at once—a Navy program on one hand and the Civil Reserve Air Fleet, on the other.

American told Weeks that the Navy's proposal would only be a duplication of effort, because as CRAF already meets the objectives of the Navy program. Plus, however, American doesn't like the loss of modern military equipment, even at a fair rate including return on investment, as a substitute of government funds for capital funds. As an alternative, if the Navy persists in its program, American suggested maybe there should be a reimbursement to those carriers with CRAF planes.

Planned Producers

Armed services, in their efforts to sell mobilization planning to industry, point out that the emphasis is shifting from developing to productive aspects.

Charles C. Francis, under Secretary of the Army, says that during the Korean war planned production costs of 75% of all civilian hard goods orders. "A state of selected stress," he said, "showed that 100% of the goods needed were not in planned production. In the field of armaments it was 90%, in ammunition it was 72%, and in weapons it was 64%."

ARDC Shift

Mayland's congressional delegation and Galt's congressional delegation, composed almost entirely of Republicans, are in a sharp disagreement over proposal of Air Research and Development Command to move from Dayton to Dayton. USAF Assistant Secretary Towner Galt last week appeared before a House Government

Operations Subcommittee to defend the shift and claimed it will save \$800,000 a year. It also will require construction of a new 50 million building at Dayton. Mary Land Representative, says to see ARDC moved is putting for full explanation of what has happened to some other decision that Air Force was last year.

'Positive Protection'

A new and interesting topic has cropped up in the new Air Force budget, where the operational support category includes request for \$2.3 million to pay for "positive protection." And what, asked a congressman at the House Appropriations Subcommittee hearing, is "positive protection?" The answer, pending meetings and reviews in a special study at a House of Representatives. According to USAF experts, it will be used at primary installations in forward areas, such as in Europe and the Far East, which might be subject to being bombed and left in a state of ruin. It will be used in the event of "major major projects" now covering Pentagon situation.

Aircraft Profits

Here is the approach investigations are taking in House Armed Services in studying Subcommittee's investigation of aircraft profits in various contracts—four Air Force and two Navy—were selected at random. Each is being assigned "house every conceivable angle."

Carriers—'Heart' of Navy

Adm. Robert Carney, Chief of Naval Operations, staunchly defended carrier aviation as the "heart of the fleet" and power for the fleet's future—through out the 1960s and beyond, and anticipate question tag at House appropriations hearings.

Carney did concede that he has spent some nights worrying about the vulnerability of carrier operating in the Mediterranean, should it be developing. Rep. George Brown had gone through about one in operation.

Rep. Charles W. Brown suggested that airplanes might have advantage over carrier aviation. Since the Navy's P-51 at SeaMaster is not a "total aircraft," Carney said a comparison is impossible.

Pointing to the \$4.3 million in changes that have been ordered by the Ford, Carney said that starting construction on a fifth carrier of this class should be postponed until the Ford has been more studied. It will not be in the operational Navy's until Spring 1966.

Rep. Henry Byrd, Republican, suggested that the costs of carrier and land bases, and the Navy's impact.

- Forded type carrier: Fordford 1190 million, Seaford 1200 million, Seaford 1170 million, fourth ship, 1180 million, fifth ship, 1190 million.
- Carrier as base, temporary, fourth, from 1200 to 1180 million, old, fourth, from 1110 to 1200 million, new, from 1195 to 1225 million.

Now emphasized that our fight is not just one of weapons such as the mobility of carriers as weapons of land bases, and added "How does one compare the cost of acquiring the rights agreement with the freedom to use the carrier?"

Funds to start construction of the fifth big carrier were included in the administration in the Fiscal 1966 budget.

—Washington staff

Airpower Advances at 'Teapot' Tests

By Robert Hois

Yucca Flat, Nev.—Major advances in development of military atomic airpower have been made during Operation Teapot, the current series of nuclear weapon and experimental device tests at the Atomic Energy Commission proving ground here.

Teapot has been largest and most complex of the five series of continental United States tests, with fourteen nuclear blasts covering virtually the entire range of bomb sizes possible on this site.

Reliable reports are that here, and overseas tests being planned at Eniwetok will include the first actual firing of guided missiles with atomic warheads.

Aircraft and helicopter pilots of USAF, Navy, Army and Marines have learned new offensive uses of nuclear weapons and how to handle properly the resulting flash, blast and radiation from atomic air attacks. In addition to providing air support, the Air Research and Development Command's Special Weapons Center at Kirtland AFB added significantly to the success of the Atomic Energy Commission's dramatic test program by performing data on nuclear explosions beginning a few minutes after detonation and by tracking clouds until full extent of radioactive debris dropped to a safe level in the sweep-around stream United States.

carrying both pilot and ecological observer, made those observations as part of AEDC's research program to determine ecological safety levels for pilots and aircraft participating in atomic air attacks.

Successful experiments with nuclear atomic warhead for aircraft and for air missiles.

High-altitude atomic drop of a nuclear device in Special Weapons Center B-36 crew in the continental test series. Drop of an air-launched missile warhead parachute was made into a 50,000 ft. smoke and pattern from an altitude above 45,000 ft. Only Eniwetok drops of a thermobaric device have been made from a higher altitude.

First testing of Repulse F-84F Thunderbolt in Teapot series was done by pilots from Wright Air Development Center supplemented by a squadron from Tactical Air Command's George AFB, Calif.

Largest helicopter assault operations aimed at exploring atomic bombs in current tests were made by both Army and Marine. Marine command, called 14 Sikorski HO4S, began to leave troops over atomic bomb blasted terrain for

This is the first of two on-the-spot reports by the editor of Aviation Week from the Atomic Energy Commission's Nevada proving grounds on the role of airpower in the ever wider test series—Operation Teapot. The next article will tell how USAF Special Weapons Center scientists and aviators have learned to control and to operate safely through atomic weapons blast, flash and radiation.

assault. Infantry force was supplied by direct observation cockpit. Army also and Sikorski H-19 copters for airborne assault on a lay ridge following an atomic tank force break through a nuclear blasted beach.

First use of the Martin B-57A, Can. test, specially modified for high-altitude atomic cloud sampling operations.

An effort involved in Operation Teapot, which 500 planes during 3000 sorties, including the air logistics support of AEC tests.

Traffic Complexities

As many as 140 planes were present, intricate patterns in the airspace above contained over the exploded levels. Over 25 miles square and within the altitude from 15,000 to 50,000 feet. Within this area aircraft from three services and from bases as far away as Lexington, Mass., and Eglin, Fla., the atomic patterns from each plane in pilot, base and space within plan or man or 70 seconds, plus or minus 200 feet in altitude, and plus or minus 200 feet lateral separation.

Traffic control and safety are complicated. Each plane must stay above a predetermined plane in space at exactly 100 feet and execute its exact flight pattern in the bomb area within the narrow time and sequence limits previously assigned to it by Col. Harry Dowell, commander of Special Weapons Center's 4923d Atomic Test Group, and his operations officer, Col. Paul Tucker. They control major air action in bomb area.

Intense and violent combat-type action as required by fighter bombers making simulated bomb drops and by cloud sampling. Thunderbolts further emphasize control. Eniwetok of this operation requires considerable practice

by participating units, coordinated by USAF radar.

National operators of this exercise by a mixed bag of pilots and air personnel assigned from their different services, over half of which are located and taken from bases scattered all over the U. S., indicates the high degree of skill and precision American airpower has developed in handling nuclear weapon delivery and the aerial support required.

Flying observers get watching this precise concentration of airpower at a single point of time and space in "I would hate to be in an enemy target area this way actually was attacking."

Test Purposes

Nuclear tests at the Nevada proving grounds have two main purposes.

To find out how nuclear weapons behave under conditions as production models and significant beginning production for shipping.

To provide diagnostic experiments required by Atomic Energy Commission scientists in their development work.

There is a big difference between actual nuclear weapons getting full pressure and nuclear test devices used for AEC experimental purposes. I gather the impression here that these still are more variables in nuclear weapon behavior, and the state of the art still is advancing rapidly with each test series.

The military, also, use tests to develop atomic war tactics and to train troops in atomic weapons use. The USAF and Navy want to determine stream bombs with the most accurate characteristics and high explosive output for changes for routine practice near low atomic bombs are too expensive for regular practice. Consequently, the service attempt to make maximum use of test debriefing to electronic systems in flash, blast and radiation effects and to deliver techniques.

During the current series 4923d Atomic Test Group's crews made three nuclear air drops from B-36s and one high explosive test of a device built



NUCLEAR WEAPON explodes at Yucca Flat atomic test area after drop from Convair B-36.

ing at high altitude as a preliminary test of fragmentation and pressure effects. This data is the nuclear warhead on the firing.

Improved Techniques

Atomic test group drop techniques and precision have come a long way since the first continental U. S. drops in 1953 from B-50 using ordinary drop methods for bombing.

Now B-36 drops come as complex precision automatic flying devices, specially developed for job. These air drops in Operation Teapot were exploded within 10 seconds of predetermined detonation time.

The Strategic Air Command now flies tests to send over B-36 and B-7 crews on both nuclear atomic bomb delivery runs and high speed photo reconnaissance missions.

The Tactical Air Command, getting

into atomic weapon delivery business as a rapidly increasing scale, also carries with operational systems lighter-bombs and photo reconnaissance. TAC has a major problem in pilot indoctrination of convincing them that they can make a relatively low altitude atomic bomb delivery and successfully maneuver to avoid larger on blast flash and radiation effects.

North American F-100 Super Sabres, also, are scheduled to participate in these tests since the B-57 will be equipped for nuclear weapon delivery.

Navy naval Lockheed Neptune, Douglas Skyraider, McDonnell Banshee and North American Savage Thunderbolt tests indicate that all have an atomic attack capability. Marine's Douglas Skyraider, better known as a successful Korean War jet fighter, and Skyraider

MARTIN B-57 takes off for test site to collect data samples of atomic warhead cloud.



Spacanship Controls

Manual spacanship should be giving within the service. While such has been within about the expanding scope, little thought has been given thus far to the maintenance needed to control and operate spacanship. Each George W. Ballou's article is growing as per 30 space spacanship maintenance problems which he believes industry must begin studying "right now."



AIRCRAFT COMMANDER: Capt. W. L. Bailey



SPECIAL BOMB OPERATOR: Capt. S. L. Barfield



BOMBARDIER: Wg. D. L. Schmuckler, with nightgaze



FLIGHT ENGINEER: Capt. W. S. Todd, with fresh cortex

Small Business Getting Fair Share, Lewis Says

The weapon systems concept of procurement was defended last week by Roger Lewis, Air Force Assistant Secretary for Materiel. He told the Senate Small Business Committee that "influence we will not get good military supplies."

There was an admission from Lewis, however, that some public contractors have abused the system. Lewis said it was a device, naturally, for the prime contractor to keep their workload level up at the expense of the subcontractors. But this situation is not widespread, Lewis declared. He added, "The Air Force is protecting the interests of small business under the program."

Lewis told the committee that the Air Force gets more complaints from the large contractors than it does from small business firms concerning the

weapon systems concept of procurement. Lewis also admitted there has been no appreciable increase in the number of small firms dealing with the Air Force but pointed to a nominal increase in dollar value and number of contracts going to small business concerns. This year small business share of the procurement dollar should go higher in the present system concept of procurement.

Czech Plane Exhibit

At least one aircraft from behind the Iron Curtain will appear at Canada's eighth annual International Trade Fair in Toronto May 30-June 10.

Czechoslovakia's Mubrow, Ltd., will show a two-engine, four passenger jet, cockpit plane, publicly the Aero 45. Other military exhibits are scheduled by 32 companies from Canada, U. S. and Great Britain.

contract fight is increasing steadily. Lewis said the opportunity for small business to participate in USAF procurement is being substantially reduced, Lewis claimed. One reason, he said, is the Air Force shifts and maintains that price competition continues to adapt and carry out small business programs.

There has been no decline in sub contracting by the prime contractor of the Air Force, he said. Control is in used by an Air Force requirement that large contractors, under the integrated program, must submit their total program as a single proposal.

Lewis and the new Defense Department subcontracting program (AW Apr. 23, p. 15) had its inception from the USAF's Advisory Group of Small Business.

Sen. George Smathers, who presided at the hearing, termed the new subcontracting order "perhaps the most encouraging development in defense procurement."

Services Outline Airpower Plans for Congress

U. S. aircraft services has been worried that a number of plans pending for the Air Force will be phased out when production levels fall in the next two years.

The worries came in their state ment by USAF officials during House Subcommittee Subcommittee hearings.

• USAF Secretary Harold R. Talbot said: "We are going to have a lot of phasing out of our aircraft programs."

• USAF Assistant Secretary for Materiel Roger Lewis said the reduction in the next couple of years "will have to take place primarily in the second and third sources of supply."

• Brig. Gen. Thomas P. Gentry, Director of Procurement and Production Deputy Chief of Staff, Materiel, said: "We will have to place certain production facilities on standby status."

Gentry testified that a gradual reduction in weapon systems deliveries is expected to start in calendar 1956 and continue until USAF levels off at a rate required to keep its 117 wings up to date.

"We plan to maintain the maximum mobilization potential within economic boundaries," he added. That USAF is replacing the ability of the contractor to maintain his assembly line on short notice.

In fiscal 1956, Gentry disclosed, USAF has plans to buy 2,381 aircraft. These purchases, he said, that in 1955, will be made with careful consideration of the production base and a high level of subcontracting. He continued:

"We are maintaining our established policy of offering to all business enter price, large and small, full opportunities to produce those items we require. We are encouraging aggressively the replacement of small business concerns in prime contractors. We will see competition in negotiation wherever appropriate and multiple awards wherever appropriate."

Yet, he said, is up to questioning which the biggest industry is the contractor fight is increasing steadily. Lewis said the opportunity for small business to participate in USAF procurement is being substantially reduced, Lewis claimed. One reason, he said, is the Air Force shifts and maintains that price competition continues to adapt and carry out small business programs.

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by it until to give USAF 117 wings, "we do not need anything like that to maintain the 117 wing force."

Lewis told the subcommittee by two main problems ahead for USAF's second chair:

• Increasing a flow of support airplanes today and tomorrow.

• Increasing a deepened, highly competitive environment.

Lewis said the industry's position in 1954 was "gloomy." During the year USAF was able to record an increase of 94% of the aircraft stockpile for production. In terms of an income provided, he said, that was 97% of the schedule. There was a decrease in the total quantity received below the 1951 level, but all of the reduction was in the non-combat category. Major combat aircraft were received in 1954 than 1953.

At the same time, he said, quickly went on while cost went down, despite what USAF "is in a constant cost increase with the aircraft industry about prices."

Air Force Viewpoint

Lewis said the industry is unhappy because it does not feel it is getting sufficient profit on sales and appeared it has been receiving about 1.5% after taxes. He said USAF agrees that they make more than they should in terms of return on cost work.

Another major issue stressed by Lewis was the contractor's ability (AW Nov. 15, 1954, p. 31) he said.

"In adding the airplane that we buy, we are buying our subcontractors on the technical competence and the cost considerations of the program."

He said a couple of situations where the contract manufacturer has no business ahead and he has not shown the competence to come up with effective proposals, and in those cases we do not feel that we have an obligation to keep that man in business.

"As a matter of fact, there is enough business around us that we can even then what we do the real constraint of our situation, in other words, the management unit, some engineering know how and some facilities."

"If that business goes down and then appears by coming up with something that is attractive to us, we will consider it and put them back in, but we do not feel we owe anyone a living and we do not try to keep a base of the aircraft industry in a financial aid and then we have a situation that is not competitive."

Among major problems, Lewis said, there is no backlog of firms with which USAF will not do business. There are

Los Angeles Replies

As Roger Smathers Harold R. Talbot stood his feet in Los Angeles' north last week and the city took a big bite.

But we are now open to bid for that. Mr. Talbot will not address the problem of our own trucks or cars in Detroit because Detroit has 40% of its industrial equipment in the automobile industry," said Col. F. Miller, president of Los Angeles Chamber of Commerce.

He said Talbot said "there are, however, experience and skill that cannot be imported regardless of the number and location of new plants."

"We suggest that the Secretary might better spend his time and place in protecting the important national defense establishment than in plan for its destruction."

some small companies harmed from contractors because of retirement and poor practices or lack of proper ethics.

West Coast Situation

Lewis spoke up strongly in favor of negotiation and price determination, pointing out how the Air Force was then to save money. He disclosed that price determination resulted in a saving of more than \$2 million on a contract with Douglas Aircraft Co., for C-124 transports and nearly \$4 million on a contract with Boeing Aircraft Co. for B-47 jet bombers.

On the other hand, a contract with North American Aviation, Inc., for F-86 fighters was increased by \$724,000 in subcontracting proceedings.

Sermorens (Talbot) and USAF is trying to control further expansion of the aircraft industry on the West Coast. Reaching his last business approach with some manufacturers in that area because of his stand, Talbot said the decision was not his to make.

Tenacity for percent of industrial Southern California is dependent upon military aircraft by its part, he said that is dangerous.

Aircraft and related procurement will take \$5.1 billion, James H. Douglas, USAF Deputy Secretary, told the committee that figure had been reduced from \$6.6 billion.

Naval

The No. 1 fleet of the future will include large airplanes that can go to air and in fact in land planes, carrier-based helicopters capable of transporting a

fully-equipped platforms for assault operations, convey merchant ships around with vertical-lift interceptors, and single-engine combat planes with only two basic controls. Rear Adm. Frederick R. Feltz, Chief of Naval Research, testified.

Looking further into the future, Adm. Feltz reported the Navy has made initial feasibility studies of nuclear power for aircraft launch "to an advanced state after previous advantages as a vehicle for exploring nuclear propulsion in earnest."

Gen. Leonard Shepherd, Maine Congress representative, pointed out that the aircraft launch concept he depicted is not that one launch would not deliver more than one ship, also dedicated landing of aircraft through to the "distances from ships to those were increased naturally," Shepherd said. "To get across in any reasonable time, we had to have a faster and better means of transportation than the boats we used in World War II. We believe the helicopter will answer our problems," he added.

• **Capital Utilization.** "The basic concept is to make our combat expenditures so that we can peacefully feed as entire world force of men and their weapons by helicopter. This is far in the future, but we hope to attain this objective at some point."

Observations by other top Navy officials at the House commerce hearings were:

• **Adm. Robert Gray, Chief of Naval Operations,** testified that the Soviet Union may have jet engines of its own

performance than the U. S. He commented: "We have consistently underestimated these people over the last five or six years, and we have had some very serious losses. We said that they would not do this or that and that they were 20 years behind us. We have been set back on our heels very considerably. That has been true in several instances."

"We said that they were not capable of manufacturing certain types of aircraft. We have reason to believe that they are far advanced over what we thought, and in perhaps some respects advanced over what we have ourselves planned, particularly in the field of jet engines."

• **Navy's requests for funds for development of new weapons** will be increased progressively each year until they are needed equipment in the fleet, Gray said. "The Navy's 1955 shipbuilding program includes plans for construction of a conventional powered submarine and three frigates with guided missile capabilities and conversion of a light cruiser and a destroyer to give them guided missile capability."

• **Navy Secretary Charles Thomas** put vertical-lift aircraft as an operational fleet component, "one of the future." Under two other plans from his testimony, Congress has authorized by the Navy to spend \$9.3 billion on the NITL.

• **Advantages of the intercontinental missile, considered by many as the ultimate weapon** were summarized by Thomas. "I think they are quite a new idea... if we could go up within a certain range of a missile

and launch a nuclear warhead guided missile, what an asset that would be as against an intercontinental guided missile that has to go 3,000 or 4,000 miles."

Navy estimates that in future years approximately \$2.4 billion annually—provided for purchase of 2,400 aircraft—will be required to keep the fleet modern.

Army

Army's goal is that all its equipment should be as interchangeable as the parts in a car, in order to make it adaptable through the use of a wrench. Maj. Gen. K. F. Herford, Chief, Army Research and Development, reported to the House Appropriations Subcommittees.

The goal cannot be achieved and the true potential of armaments utilizing power reduced, he commented, "in long as regardless of cost has priority over lightness. We must decide whether to develop the full technical potential of light armor—or whether considerations of cost, durability, and logistic support requirements limit it."

He said the Army is in the final stages of developing an airborne armor-plating platform, capable of being airdropped at 20,000 ft. in which will be required to 25,000 ft. in capacity. Paratroopers are attached directly to the platform, and collapsible rubber tubes provide support for the air.

Nike Successor

Secretary of the Army Robert Stevens listed the findings that the Army is working on a successor to the Nike missile defense system. The "work is progressing on an improved surface-to-air missile which, if successful, will contribute much to our low altitude defense."

He added: "Progress is also being made on a greatly improved tactical support missile which has highly significant logistic and operations advantages over the currently available model. We are concentrating on a longer-range missile which will allow maximum exploitation of available destruction effect is now and improved weapons."

Army is still investigating the feasibility of extremely simple land helicopters for forward-line reconnaissance missions, he reported. Far ranges up to 10 mi., the plane might carry a payload equal to its own weight and an production quantities its cost might approach that of the prop, he said.

Development of a long-range land bomber now reported as "very promising." It would have capacity for 50 gal of fuel and a speed of 60 knots per second if it travel 40 mi. in 45 sec. without landing for refueling.

Information Conflict Flares Anew Over GOP Pamphlet on Defense

By Claude Wiese

The lines drawn by Defense Secretary Charles L. Wilson's recent drive to curb release of information unless it makes a "constructive contribution to his department" (AW, Apr. 8, p. 11; Apr. 15, p. 15) found to new heights last week.

• **Robert T. Ross, Assistant Defense Secretary for Legislative and Public Affairs,** gave the keynote at a Senate Republican Policy Committee compilation of data on weapons and military issues as a paper that "should be as revealing to the American people."

• **President Eisenhower** took a different viewpoint, saying "we must be candid in giving out the GOP pamphlet which contains information he wouldn't have published. He agreed there is need for certain types of information essential to the technological progress but no publication for release to carry out analysis between the various branches of the nation's armed forces."

• **R. Karl Hoenes,** newly appointed director to Ross, who assigned work responsibilities for security and release with the office (AW, Apr. 25, p. 11), said his group will take steps to prevent publication of confidences at the time.

He says they are very helpful to a potential enemy despite the fact that they are not in classified information.

• **On Capitol Hill,** the Wilson-Ross-Hoenes viewpoint stirred opposition House Democratic Leader John W. McCormack accused Wilson of having one viewpoint in the Pentagon and another in the GOP. Assistant Democrat Rep. Melvin Price, and majority allies indirectly are being based on "political expediency." He demanded a congressional investigation on the matter.

• **Democratic Senator Stuart Swartz,** a former Air Force Secretary, saw a parallel between Wilson's doctrine and those issued by Gen. Paul Gribble. He predicted that "this order will either be reversed fairly promptly or there will be a great protest all over the country."

• **In an attack** launched to the American Society of Newspaper Editors, its own action as an "agency" for information control that the trend is a threat to American industry. Communications experts, the committee said, is essential for fast dissemination of technical advances. The committee also said that

the Wilson doctrine could impair relations and it is up to the public, not the Defense Department, to decide what is "constructive."

• **Madison G. Braden,** a Catholic University professor and former Atomic Energy Commission official, told the ASNE that Braden's claim to suppress unclassified information "will go to nothing, progress can proceed faster and simpler technological progress."

Bradens criticized the idea that prior publication, prior clearance and lower means knowledge no longer a factor in determining what can be told to the public.

Highlight of the work was a press conference called by Wilson to introduce Braden and announce that he will have a special assistant at his office to handle security matters. Braden said the new assistant will be an expert on all concerned with release with what is top secret and confidential, but the new Defense Department assignment of handling what unclassified matter can be made public.

One of the fields of activity, he said, would be an effort to reach completion of release material in magazines and technical publications if his office decided it might help in some.

Officing Opinions

Questioned specifically about the GOP compilation, Braden said: "The order does not mean that particular pamphlet would help a potential enemy because it would not help him build a weapon."

On this question, he was defensive and said, with Ray Price holding that the document titled "National Defense Under the Republican Administration," is a study of the type that will let "the Soviet Embassy" withdraw every step it has taken in the country.

Ross, in a letter to the Congressional Staff, Chairman of the House Armed Services Committee, about the Republican pamphlet, and it did not break news.

Then he stated it also includes "how many technological secrets" past

Wilson himself did not comment on the GOP compilation but accorded his observation for members passed by the press, or responsible Defense Department officials in which he said "this is about."

He gave it as his opinion that, of these, his own political cause, at least, con-

gration of unclassified data on a single sheet or table, says in terms agent as a list of "classified" and suggested that the press give its fullest cooperation in the matter.

Asked to clarify his role that Wilson said should make a "constructive contribution" to the department, the Defense Secretary declared that this is reasonable.

Air Force Order

"I don't know how to define good information," he said. "If you just let us squint for a while, we'll all understand it. Let's see how it works."

In a second statement, Wilson said "We have made progress" since his departure was issued May 29, but he does not say details.

He also denied fully that the department is seeking to "fortify" or "stagnate" the flow of information.

Meanwhile, the Air Force received instructions from the department intended to raise the Wilson doctrine. These also demand the compilation type of story.

The release of operational or technical information on our specific military weapons or new type of military equipment is within its field of activity.

However, collection of such work must not be management on our work as a document which prevents a complete picture of our technical advances or operational capabilities in some particular military field. As with the document, no report classification."

USAF officials are ordered to submit instead for clearance if they report it is of national significance or could help an enemy in any possible way.

Air Force General's Named to New Posts

Major Gen. Clarence S. Irvine left with his second USAF Deputy Chief of Staff for Materiel and succeeded by the White House for promotion to the rank of lieutenant general (AW, Apr. 18, p. 11).

His replacement, Lt. Gen. Robert L. Bostrom to the Pentagon post, Gen. Bostrom is transferring from a recent three years' preparation to retirement in the next hours.

Other changes:

• **Gen. Karl E. Farnburg** was nominated to replace Gen. Benjamin W. Chaffin as chief of the Continental Air Defense Command and the Air Defense Command, Gen. Farnburg has recently been in command of the Far East Air Forces.

• **Lt. Gen. Laurence S. Kuter** commander of the Air University, soon moved to be commander of USAF with rank of general.

Aviation Funds

The three military services had more than \$25 billion in unexpended funds on hand March 1 to finance aircraft, ground units, and electronic equipment. The unexpended balance totaled \$2 billion. (Continued figure on next page, affecting the balance between gross obligations and actual expenditures.)

	OBLIGATIONS (in thousands)		EXPENDITURES (in thousands)	
	July 1, 1954	March 1, 1955	July 1, 1954	March 1, 1955
Army and Air Force				
Army	10,600	2,744,000	5,700,514	410,845
Air Force	50,261	2,911,151	1,150,454	1,157,146
Army	4,778	113,999	321,478	3,003
Air Force	139,197	3,459,818	6,374,441	816,947
Naval Vessels				
Naval Vessels	10,761	554,599	456,123	68,827
Naval Vessels	1,206	38,881	2,730	1,950
Naval Vessels	8,572	516,718	453,853	69,777
Naval Vessels	18,768	596,423	712,751	36,150
Electronic and Communications Equipment				
Electronic Equipment	17,001	345,811	470,896	29,176
Electronic Equipment	9,435	62,548	119,830	15,389
Electronic Equipment	3,972	33,467	591,986	11,756
Electronic Equipment	18,434	402,818	906,712	56,791

AHS Awards Top Copter Honors To Bell's Kelley, Okanagan's Agar

Bertus Kelley, chief helicopter engineer for Bell Aircraft Corp., and Carl Agar, vice president of Canadian Okanagan Helicopters, Ltd., last week were awarded top prizes at the 11th annual Helicopter Night Dinner of the American Helicopter Society in Washington, D. C.

The society also selected a military helicopter pioneer and an innovator for honorary fellowships. They were presented by Gen. William G. Krupp, first Navy aviator to qualify as a rotary wing pilot, and Austin Pittman, Canadian helicopter expert.

► **Klemm Award**—Kelley, past president of AHS and present chairman of the National Advisory Committee for Aeronautics subcommittee on helicopters, won the society's foremost honor, the Dr. Alexander Klemm Award. It is given "for notable achievement in the advancement of rotary-wing aeronautics." In 1944, the award was won by Michael Cushman, chief engineer of United Aircraft Corp.'s Sikorsky Division.

With Bell since 1941, five years before the company sold its first helicopter, Kelley is credited with developing the Bell standard two-bladed semi-rigid rotor system. He also has made substantial contributions to solving problems of stability, vibration, fatigue and loading.

A former commercial helicopter pilot, Kelley's lively figure and retelling of his work have been familiar to AHS meetings for many years.

► **Kessler Award**—Agar was chosen by the society for his ongoing Villages I Kessler Award, presented annually, for the greatest enhancement in practical application or operation of rotary-wing aircraft, the value of which has been clearly demonstrated in actual service during the preceding year.

Druggan's operations record recently goes back to 1949, start of the famous Alouette Conversion of Canada power construction project in the Canadian Northwest. Agar, using Bell Model 47 helicopters, flew men and materials into inaccessible camp sites over a period of more than three years.

Winner of the McKee Trust Canada "Trophy" for the greatest contribution to the advancement of aviation in Canada during 1959, Agar's operations has continued to grow until he now runs a substantial number of Bell and Sikorsky operations and is recognized as one of the outstanding commercial rotary-wing experts in the world.

► **AHS Fellowships** — Commander Krupp, honored with a fellowship for

unselfish service in the advancement of rotary-wing aeronautics, has been in the field since 1945. A Navy pilot, he joined to fly a helicopter with the Coast Guard and later left the service to become chief test pilot of Sikorski Helicopter Corp.

Returning to active duty with the Navy in 1948, Krupp has been a group test officer in the Bureau of Aeronautics except for two years when he commanded a cargo squadron on the Pacific Coast.

Under the first helicopter system test flight in 1944.

Austin Pittman, awarded the second fellowship, is a helicopter pioneer whose work dates back nearly 25 years. One of his recent, the Pittman 202, was used by the Germans in the early days of World War II.

Tolson has just his own rotary on Long Island (AW Nov 28, 1954, p. 28)



BARTRAM KELLEY

and holds a military commission under which he is designing large helicopters with extended life. Pittman, credited with developing the interesting rotor system as he built in 1937, fled Nazi Germany toward the end of the war and came to the United States in 1947 as a consultant to the Office of Naval Research.

Lee Criticizes Heliport Conflict

Civil Aeronautics Administration wants helicopter operations and manufacturers to drop arguing about which causes first—helicopters or heliports.

If they pursue the discussion, CAA Administrator Fred B. Lee said last week, we will wind up, instead, with our Helicopters never shed rapidly extending helicopter use on into down town areas of the world.

► **Differences of Opinion**—Lee spoke at the annual Helicopter Night Dinner of the American Helicopter Society. He was referring to the differences of opinion expressed in the past year by the Helicopter Council of the Aircraft Industries Assn. and the helicopter operators of International Air Transport Assn.

The AIA group recommended that manufacturers delay making final plans for heliports pending development of acceptable transport helicopters. IATA viewpoint is that heliports should be built and aircraft designed to fit them. In Lee's opinion, they are working that branch.

"On the grounds that performance information on the kind of large helicopter that will be used as future transport operation is not now generally available, so decisions to plan for heliports have been designed for transport use," he told AHS.

"And currently, since no precise information is available on helicopters, the helicopter designers may not be able to be expected to design the vehicle to some indefinite standards."

► **Path for Action**—Lee added that

CAA, although cautious, believes there is a clear path for action.

► **Manufacturers must act** for a quiet airport and one that can take off with a new vertical direction.

► **Manufacturers must not delay** putting into and at least obtaining an opinion on the property.

Lee said CAA's heliport design group is much to help and discussed that it has been studying the situation in the Northeast, Va., area of the request of the National Aeronautics, which has proposed a helicopter service to be that region into its land wing routes.

► **Progress**—Several other highlights from Lee's AHS address.

► **Progress is being made** toward certification of military and civil requirements so that eventually military helicopters, with few exceptions, will be designed to meet civil aeronautical standards.

► **Noise and safety** are prime problems the industry must solve to make the helicopter an acceptable transport.

► **It will be another year** before Part 46 of the Civil Air Regulations will be drafted, establishing broad rules for helicopter operations.

► **New Civil Aeronautics Board rules** on civil aeronautics will divide helicopters into three groups, based on weight up to 6,000 lb., 6,000 to 17,500 lb., and more than 17,500 lb. For the top group, those carrying 20 to 40 passengers, more than one engine is required.

► **In implementation** of the rules, in respect to flight testing and flight standards will not be the cost of certification.

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Army to Use 50 Copters for Bush Survey

Fifty helicopters will be used this summer to help the U. S. Army conduct topographical surveys of 155,000 sq. mi. of rugged terrain in Alaska and Iceland.

The Alaskan operation will be a continuation and enlargement of a project started in 1953, covering its expedition north of the Arctic Circle to Point Barrow. This job is being done by the 10th Engineer Group (Topographic Survey), based at Fort Winfield Scott, Calif.

In Iceland, the entire island will be surveyed by the Army Map Service.

Major differences in the flying operation, outside of their size, is that the Alaska job will use 47 Army helicopters—seven Sikorsky HO4Ds and 40 Heliok II-23s. The Iceland expedition will be served by Bell Helicopters, Inc., which will provide three Bell H-47s on contract to the Army. Bell has agreed to transport the aircraft to Iceland, providing pilots and all equipment for engine maintenance except gasoline and oil. The operation is guaranteed a return

time of 300 hours flying time for each aircraft and will be paid \$109 an hour for these use.

New Army Orders

The Alaskan survey group—numbering 1,400 men in the expedition, will cover about 56,000 sq. mi. In Iceland, the Army Map Service will study terrain of the entire island, about 79,000 sq. mi.

Army's 30th Engineer and rail company, with five years of experience in the bush country. They have their own Aviation Section of about 500 men, including 71 pilots. Already well on their way north, they have a record of more than 17,000 hours of helicopter time down in Alaska since the project started in 1950.

In addition to the helicopters, the party will be equipped with five Cessna L-19 observation planes, six de Havilland L-20 trainers, aircraft on the de Havilland U-1 cargo crates and one Beech L-23 command plane. The project will

use some of the Army's first new U-1 trainers, equipped to operate with wheels, skis or floats—depending on the terrain.

The 10th's Aviation Command, in its report on last year's Alaska work, makes a strong point of the fact that the units using aircraft are used to work for the one job which they alone can perform—carrying supplies to points devoid of landing areas suitable for conventional aircraft.

Whenever possible, personnel and gear for the survey groups are shipped in, over barges or USAF C-124 transport. Sometimes paratroops drops are necessary; in other cases, equipment can be shifted to smaller planes at a landing strip and flown to the last camp.

Aircraft Uses

In Alaska, the 30th Engineer Group will have about 100 miles of operations flying weather, taking from the Ma through June. All pilots get a course of advanced training to equip them for the unusual operating conditions in the bush country.

Here is how the aircraft are used:

- The helicopters move personnel and their equipment in and out of remote spots, keeping them in contact with the base camp.
- Copters and L-4Ds take out men, supplies, equipment.
- All types of aircraft, but mostly L-23s, move personnel, equipment and return to the camp.
- L-4Ds and L-23s drop supplies at places where landings are impossible. Included are 55-gal drums of gasoline, mostly dropped in a lake with enough sawdust to carry them to shore.
- L-23s, L-19 and L-20 aircraft transport personnel, mail and gear to points beyond base camps and to headquarters of the Alaskan Command at Elmendorf AFB, near Anchorage.

On this year's expedition these will be replaced with new equipment from



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adjusting gear boxes and gathering data to improve the efficiency of future operations.

For the Army, there will be one Transportation Corps office along to keep charge of group credit transactions.

Phoenix Tower Design Aids Safety

Phoenix, Ariz.—One of the most unusual control towers in the nation is the 187-foot tubular steel structure at Phoenix Sky Harbor Airport. The unusual design is said to provide maximum safety and efficiency in operations.

Built at a cost of \$165,800, the tower is glassed-in control room contains more than 360 pieces of equipment. The carillon weighs 75 tons, is 100 feet wide.

Phoenix Airport.—The tower is the outstanding landmark of the new Phoenix terminal. Many airport features, such as its \$500,000 garage, still are under construction.

The 17-million Sky Harbor Airport provides space for more than 70 hangars, a \$605,000 terminal, nearly 20 aircraft maintenance bays, a private plane terminal and three runways—5,500-foot, 6,000-foot and 5,100-foot long.

The terminal includes a waiting room, bus, dining room and coffee shop, airline ticket office and Hertz Automobile Rental office. The building also contains administrative offices, Civil Aeronautics Administration facilities and an observation deck.

Construction of the airport, located five miles east of downtown Phoenix, followed passage of a \$19-million bond issue.

15th Budget Field.—Both the increasing number of flights and growing number of aeronautical concerns based there indicate the importance of Sky Harbor, 15th largest commercial air-

field in the country. Traffic movements at the airport reached an all-time high in November 1958, with 10,800 flights cleared by the tower.

CAA statistics note the flying accident at Phoenix as the best of all major fields in the nation. Average wind velocity is 5 mph and annual rainfall 7.25 in.

The airport is served by Braniff, Frontier, American and Trans World Airlines. Sky Harbor provides air-traffic service.

Airline lines located at Phoenix include Adair-Russell and Bobb Co. Others are plane distribution and repair services. These companies employ, two aerial spraying firms, and two flying schools.



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HAL Reports Highest Net Loss Since 1929

Hewlett-Packard reports a net loss of \$517,198 for 1954, the owner's worst financial year since its incorporation in 1939. In 1953, HPAL had a net profit of \$13,048.

The sale, after payment has reported by the airline was a \$1,600 net decrease in 1990. But Haworth's profits have slipped since 1989, when Civil Aeronautics Board ended HAW's monopoly of scheduled routes to the island and recruited Trans-Pacific Airlines as a competitor.

Rotating president Stanley C. Ken-
nedy says factors responsible for the
heavy loss included:

- Depreciation of ground and light equipment, principally its five Convair 440s, increased to \$741,624 from \$534,632.

- Mail pay, including federal schools, was cut to \$799,573 from \$435,790
- Operating expenses totaled \$5,264,108, an increase of \$296,422

Hawarden's share of international traffic dropped to 70.4%, compared to 72.4% in 1955 when the airline had an all-time high of 346,462. Total passenger volume last year was 387,857, a 2.16% decrease.

Kennedy says H&M's curtailment of flight schedules is an attempt to reduce operating expenses led to the loss of competitive position.

TWA Gets New Route For Europe Network

Connection of TWA's World Airways' hub-and-spoke London-Frankfurt route with the rest of TWA's European system has won Civil Aeronautics Board approval.

The race has been described as "the most significant decision since TWA was awarded permanent route status" by Warren Lee Paxon, TWA board chairman.

The new route, which links Frankfurt with Zurich, will give Aeromexico flag carriers a better position in the competition with foreign carriers for European traffic.

In granting the new TWA route, the Board denied an application of Pan American World Airways to serve Rome as a joint between Frankfurt and London on the grounds that TWA's proposal offered fewer benefits and the impact of two American carriers on the

Frankfurt-Rome route would create an unnecessary and undesirable duplication of services.

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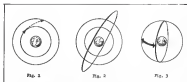
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ORBIT CHANGE: Tangential thrust increases orbital diameter (Figure 1). Angular difference in direction changes the orbital size and position of apogee and perigee (Figure 2). Astrotuff change moves the orbit geographically (Figure 3).

change position outward from the body about which the ship is orbiting. There must be applied tangentially to the orbit. Any variation from this one direction either in direction or amount will bring about a different orbit.

Thrust applied tangentially to the orbit will change the size of the orbit. An angular difference in direction changes not only the size of the orbit, but the relative position of perigee and apogee as well. A change in the amount will then effect a

geographical change in the orbit.

There are other means for measuring a orbital, but the above examples are sufficient to establish that a variable in its space will be required. Low-draft given with microelectronics circuits for remembering previous data may answer this requirement. Automatic electronic may permit the establishment of a new space fix, but such a device will still require a new type computer to count the ship is no longer moving parallel with respect to the earth's surface, but rather in a circular path.

Speed Measurement: The position of velocity is not only interesting but that long. The problem is three fold.

- How will we use it?
- How will we measure it?
- How will we indicate it?

The use of miles per hour or knots will only tell us that we're going at a steady speed. Any careful indication of velocity will be of little use, although the actual distance must be known very definite dimension. Velocity will be required also to determine whether or not orbital speed has been reached for a given altitude. Present orbital velocity appears to be a way of indicating orbital requirement.

In the early phase, the requirement will be "altitude" or "maximum velocity" relative to a given altitude to produce relative density.

In landing, the requirement will be rate of descent rather than velocity.

In every case measurement will be in some form of velocity with respect to a distance or plane of flight and is relative to the earth, altitude, or orbit.

The actual measurement will be no easy task. The use of conventional methods will obviously be useless. Perhaps the Doppler principle will be used, or even measurement of changes in a central fix. There is one thing about this problem we do know today—nothing exists to make the measurements.

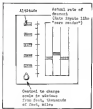
How High the Moon—Altitude measurement and indication will also be a difficult problem to solve. Again we have a threefold task.

- How will we measure altitude?
- How will we indicate it?
- Altitude with respect to what?

It may be a few thousand feet, miles, or even some distance yet to be decided. Whatever it is, the measurement will have to be coordinated with the orientation of the vehicle because the altitude will depend on the type of operation.

If the ship is ascending or descending, the altitude will probably be measured in feet and thousands of feet. If the ship is orbiting, the altitude will probably be measured in miles from the body about which the orbit is established. As soon as the vehicle leaves the orbit for further travel, however, altitude resolves into distance and thus becomes a function of navigation. Regardless of how altitude is measured, the rate of change of altitude will be of the utmost importance to the pilot and will probably be indicated as feet per minute, and miles per minute.

In addition to any numerical indication of altitude in rate of change of altitude, there will have to be some form of detector in place to prevent overcontrolling.



ALTITUDE PLOTTER

When Are We There? The determination of flight path will be essential in order to keep a continuous check on the position in the orbit and along trajectory into and out of the orbit. This again will be "how high" information relative to a preselected flight path.

Orbiting might be compared to hovering in an aircraft. It will be the first stage of the flight path to any extraterrestrial operation and will be the last stage of flight prior to entering the atmosphere for landing. Flight path measurement in the orbit should be relatively easy to fly and indicate near altitude



Altitude rate of descent



SPED CONTROLS for recording descent on graph related to ideal indication



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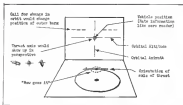
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FLIGHTPATH PLOTTER has everything built in: with altitude, distance and position data.

and axially relative to the curb can be measured to establish position and change of position.

If interplanetary flight is undertaken, the problem of determining position is even more complex. A combination of inertial navigation and automatic star tracking may be adequate but the computer involved in shifting from orbit to orbit will require very complex routines.

A continuous indication of flight path will be an absolute must for rendezvous with any satellite, because of the intricacies of orbital mechanics.

► **Fuel Indications**—Power and fuel indications will be extremely important since the risk of consumption of fuel will undoubtedly be critical. Power will probably be measured as thrust and is located in front of power available. Fuel capacity and fuel consumption can be measured in several ways but the indications will be a difficult problem.

The rate of fuel consumption as well as fuel remaining will have to be under constant observation in order that any discrepancy in the fuel program will be detected. Therefore it will be necessary that the radiation be such that the pilot will become aware of the condition without any misinterpretation or possibility of error.

• Condition Two—In the case of a spouse



TABLE 6. GASES DETECTED AND AFFECT RATES

nationwide laws, selectivity and engine condition.

In addition to the temperature associated with the powerplant, perhaps the most important measurement will be the temperature measurements resulting from skin friction at takeoff and re-entry, from solar radiation or re lock, and the rise in temperature due to the impact of solid particles in space.

Loss of Pressure

Preservation will be a continuous worry to the pilot at the spaceship and will call for some kind of damage control to take care of any loss in that preservation of the critical compartments of the vehicle. Not only will the general maintenance of the system be needed, but the survival and condition of managements at each compartment will be required. In every compartment of the vehicle an indicator of some positive reading type will have to be conspicuous, because any loss of pressure will necessitate immediate action given action, possibly the downing of a rocket ship.

Radiation—Indication of the radioactivity of the ship will undoubtedly be exposed. At this time there is little known about the conditions to which the space vehicle will be subjected, but from data obtained from present aerospace research programs, it is almost certain that the ship will be under heavy bombardment by cosmic rays and other forms of radiation. With no blanket or air to absorb the radiation it will be necessary to shield the personnel within the ship from the effects.

Engine emitters will be required to continuously notify the occupants of the presence of a hazardous situation. Such notification are initiated when over-inductive materials are being used.

There is one interesting thing about a spaceship in the event, however, and that is if the engine or powerplant fails, the pilot will be able to get out and fix it. In the case of an airplane the pilot is always worried whether or not it will stay in the air. In the case of a spaceship pilot, his main worry will be knowing that if his powerplant fails he'll probably never see it again.

Little attempt has been made here to solve the instrument problems connected with apogees because very little is known about the problems, let alone the solutions. It is apparent that since men are now thinking seriously about space flight, they had better think equally seriously about how they are going to give pilots information they will need as the serious project will take off.

Let's build this one around the pilot, instead of working out all answers to questions unvoiced questions.

FOR YOUR
NEXT FUEL
OR HYDRAULIC
SYSTEM
CRASH PROGRAM



Where can a Parker Team help you?



When Lockheed Aircraft engineers called Parker, they wanted action: Lockheed had designed a new hydraulic system to give more positive control over the power-operated elevator trim tabs on the F2V Neptune. As a result of the new design they had a requirement for a float valve which was not available from any supplier.

In 18-days-of intensive, day and night application and working so closely with Lockheed they were practically an extension of the Lockheed Engineering Staff, a Parsons team from the Hydraulic Division delivered the first unit. In this short turn they had designed the new valve with a new seal, made changes, and started production. The system was installed in an aircraft and found to be satisfactory that it was subsequently installed in earlier F2V models as well as current production.

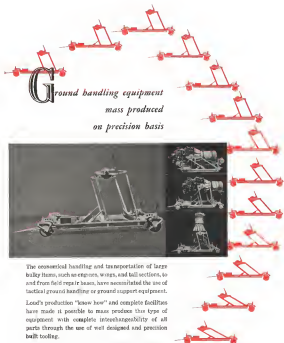
The new system employs two valves per phase. They are direct-actuated, operated, non-interflow type, with a normal operating pressure of 3000 PSI. Internal leakage is less than one drop in any position and the maximum flow

sure drop is 100 PSI at 4 GPM at 90° F. Actuating time to energized position is 0.1 seconds maximum and to normal position is 0.5 seconds maximum. The solenoid is continuous duty type with a maximum current drain of 1.5 amperes.

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Trade Secrecy Slows Aviation Progress, SAE Panel Holds

By Henry Lefler

Too much secrecy and emphasis on protection of proprietary rights act as brakes on aeronautics progress. This was the majority opinion of the panel on The Challenge of Cooperative Design moving in the Jet Age, at the recent meeting of the Society of Automotive Engineers in New York.

The majority view was that pride of ownership and its own "house children" provide the strongest ice program.

But all agreed that there is a great need for standardization all the way down the line—from selection of mounting brackets to specifications for raw materials.

Some points made by panel representatives were:

- Navy—Lack of cooperation in industry engineering effort hampers the industry, said J. E. Sullivan, director of Navy Bureau of Aeronautics' Aeronautics Equip-

ment Division. "I suspect that a great portion of our special equipment items affect basically only individual units and not unique operating conditions at all. So often we confuse the word 'better' with the word 'different'."

He complained that he had yet to find two aircraft hydraulic systems that were even somewhat similar, even though both might perform identical functions under identical environmental conditions in quite similar aircraft.

Subordinated industry to "bring a hell of a lot of trouble and change none of them out for all to see" at the conference table. He also asked for closer integration of military and commercial requirements, products and their construction specifications. The services could help by writing their specs such as around joint government needs, and sticking to these for as long periods of time as possible.

Standardization is no enemy of our competitive economic system, Sullivan said. "The services prefer a product that is very much like a competitor's because they know it is a widely interchangeable item."

Given the choice, we will always select the item that does several jobs acceptably well over one performing a single job in perfect fashion, but we look for only a minor variation in its assigned capacity," he pointed out.

- Air Force—The Air Force has delegated responsibility all the way down the line to make certain that standardizing practices are followed.

"We are facing 25 different specific units designed," said W. L. Coleman, representing the Air Research and Development Command. "In something as critical as ejection, the pilot must use the maximum procedures and sequences, which differ from plane model to plane model."

Coleman saw three immediate fields for cooperative engineering effort: weight reduction in standardized materials, new developments to combat temperature problems in high-speed aircraft, and water acceptance of materials that have become standardized.

• Aeronautics—D. M. McGinnis at Boeing Aeronautics Users Dev. and components are often made easy because designs are commented without study of all available substantiation. "You cannot build an optimum design by taking large existing components as they are found, and fitting in the smaller ones to fit."

- Materials—Specifications must be developed for newer materials, said C. M. Miller of Northrop Aircraft, Inc., at-



Hot Viking

Viking 12, Martin Navy research rocket, hits off the firing table as a shot of storm during the first five minutes of test flight which reached a peak altitude of 344 mi. Extensive aerodynamic research also has been done. Physical characteristics of the supersonic and subsonic high-speed photos. Viking 12 weighed in at 11,000 lb and measured 45 ft long for the flight. Powerplant is a Reaction Motors, Inc. liquid-propellant unit rated at 21,000 lb thrust.

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chasing malfunctions and restrain others, engineers and possibly vital maintenance, view customers for high temperature hydraulic fluid packing applications, heat-resistant transparent materials, and radiation-shielded materials.

Miles suggested an industry-supported, non-profit qualification organization which would draw up lists of approved materials and their specifications, based on data supplied by independent test laboratories.

• Pyroclasts and popovers.—A posting of creative talent in the development of new powerplants was suggested by F. H. Nason, of Westinghouse's Aviation Gas Turbine Div. His staff design team had already studied the cause of all gaspans and chosen the most promising approaches for all industries to follow. Nason also called for standardization on location and spacing of engine mounting points, for instance, so that no placement of one engine type with another would be complicated.

J. B. Rame of Curtiss-Wright's Propeller Div. added an amen to this. No two popovers manufacturer would do the same, he said, even though the props are identical and the same standards for metal both.

• Standards.—Progress in SAE committee in setting up industry standards was reported by D. E. Kallman of Boeing Aerospace Co. Drafting procedures are being simplified. The changes are being taught in schools, will soon appear in test books, and in a few years should be standard in aviation.

Other SAE committees are working on standards for helicopters, cockpit dash and vibration, and location and operation of exits, emergency lights, air ribs and fire extinguishers.

• Aircraft.—Standardization programs of the future must be streamlined, said Boeing's John F. Cooney. Minor or minor to standards often require a vote between the line of authority and new plans.

Future aircraft models and development of the "post-battle concept" will bring new demands for standardization and cooperative engineering. Cooney pointed out, because 100% reliability and accuracy will be required.

Data Unit for Missiles, Aircraft on U.S. Tour

Johnson-Labrey Corp.'s \$100,000 "Data Cruiser" is on a national tour to demonstrate the three-computer system's ability to evaluate design and performance of guided missiles and aerospace vehicles.

The computer was designed by Bernard S. Bennett, founder and president of Johnson-Labrey Corp. and former chief of a British guided missile project.

Safety Net Protects Convair F-102



WHEN SAFETY NET is let by Convair YF-120A's nose landing gear, a steel cable will snap up to catch main wheels. Photo shows test at Langley Field, New York. Net has been installed as a safety measure for F-102A high-speed taxi trials.



ANCHOR CHAINS, weighing 10 tons, are attached to steel cable to exert powerful braking drag. Convair says the apparatus can stop a plane as fast as 600 ft.



REVERSE CONE, being adjusted, holds pivoted steel cone and roller shock absorber. Present cone prevents double cone action on landing cable.

LEAR PICTORIAL ATTITUDE INDICATORS

...first in concept...first in production

The Lear "two-hand" attitude presentations shown here are a new concept in aircraft instrumentation. As the latest development in the famous Lear line of Vertical Gyro Indicator systems, these Pictorial Indicators have been ordered in quantity by both the USAF and BuAer.



Climbing turn as seen by McDonnell F-4 pilot on his Lear 97 Pictorial Attitude Indicator.

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Canada Builds New Supersonic Tunnel

A new supersonic wind tunnel, with test section between 4 and 5 ft in diameter and capable of speeds up to 1,000 mph, will be the primary installation of the new Canadian DeLaval Research Laboratory.

Designs are being completed for the tunnel and construction is expected to start this summer, with completion due targeted at 1978. Total cost is estimated at \$3.5 million.

The tunnel will be located at the Uplands Airport near Ottawa. It will be separated from control of National Research Council as completed.

The choice of working section area and operating Mach number was dictated by Canadian scientists who wanted to keep the tunnel comparable to similar tunnels in the United States and Great Britain.

NBS Reports Cheaper Magnesium Treatment

A potentially cheaper coating for protecting magnesium alloys from salt-water corrosion has been investigated by the National Bureau of Standards under Army sponsorship.

First results of the study show the new coating gives protection from salt spray equivalent to that from other current anodizing processes.

NBS says that a low-voltage power supply and only two chemical components other than water is what gives the process its potential economy.

Coating is mostly zinc and gallium in a solution, but not in sodium chloride as in other the current HAE is also chrome oxide coatings. Uniformity can be improved by using suitable anodizing procedures, the Bureau says.

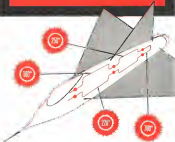
Hand-Forging Alloy Properties Improved

Higher tensile strength, improved fatigue life, and improved creep resistance have been achieved in 7075-T6 and 2014-T6 alloys, announced by Kaiser Aluminum & Chemical Corp., are expected to give better fatigue life and improved fatigue resistance in air and pure vacuum from the alloys.

Tensile and yield strength and elongation have been improved for all classes of forgings, according to the manufacturer. Both alloys are heat treatable and readily machinable.

"Aluminum hand forging" is the name given to a class of forgings used for high-quality production, as in a temporary manner before producing the forgings.

An Edison First! Separate alarm points in a single circuit with a continuous coaxial cable fire detection system



Edison was first to offer a fire detection system allowing

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Punch Card Control Gives Auto-Assembler Flexibility

By Philip J. Kline

A new "automatic factory" for assembled assembly of military electronics items, with built-in flexibility to handle short production runs and frequent design changes, is slated to begin shakedown tests at General Electric test month.

Flexibility of the new "Automatic Component Assembly System" (ACAS) comes from the use of punched cards to give operating instructions. Its change over ACAS production involves only a switch of punch cards and a change of components and printed circuit boards.

The punch-card control also distinguishes ACAS from competitors such as Tindley and Autodyne.

ACAS, whose existence was first revealed in *Aviation Week* (Nov. 17, 1972, p. 36), includes provisions for component preparation, test, placement on printed circuit boards, dip soldering, and strain test. The program is sponsored by the Signal Corps.

► **ACAS Capacity**—The present component placement head in the new system will be able to install 1,600 components per hour in printed circuit boards, according to Ben Warner of GE's Advanced Electronics Center, who described the machine to the recent national EEC convention. George Gamble was moderator of the paper.

The system's output rate at present is limited by the capacity of the automatic dip soldering station. ACAS should be able to turn out 120 boards/hour with 13 components installed on each.

Up to 50 components can be installed on each board, depending upon its size.

Four-Man Operation

The entire system, including component preparation, test, installation, dip soldering, and strain test, will occupy an area of approximately 15x10 ft and require only three or four employees. One or two employees will manually load components into two carousel preparation machines, another will load predrilled circuit boards into pallets for conveyor handling, while another will supervise overall operation from a master control panel (see story, right).

► **Capabilities and Limitations**—The present design can handle any type of lead-mounted, lead-supported component such as resistors, paper capacitors, semiconductor tubes, and some types of pulse transformers.

ACAS presently cannot handle flat-mounted, flat-mounted components, such as wire sockets, transformers, photoresistors, electrolytic capacitors, or miniature tubes. This requirement was not included in the original Signal Corps spec, a GE spokesman says.

Operational Sequence

GE's approach to the problem of mechanized handling, test, and insertion of tiny electronic components, with a variety of shapes and sizes, involves the use of shunt trays, drilled component supports. A magazine holds 20 individual component carriers, each of which carries a single component by clamping the component's leads in a set of barbed pins. The pins are opened or closed by turning a small wheel one-quarter of a turn (above right, photo 2).

► **Component Preparation**—A component magazine, containing 20 empty carriers, is brought to one of the component preparation machines by conveyor, and then to the machine's rotating station (photo 3). Here the empty carriers are mechanically removed and placed one at a time step a small wheel on a rotating barrel.

When the turret rotates into position (clockwise), the empty carrier (with pins open) moves to a component whose leads have been straightened, shaped, and trimmed as required. The shunt plate in a single operation at the one station. The carrier pins are then automatically closed, seating the component. Components are fed into this station from a manually loaded magazine, not shown in the photo.

Components with two axial leads (like composition resistors or paper capacitors) are inserted at the first station, while those with multiple leads are inserted at the next station. Only one of three two stations is used at a time.

A magazine of 20 identical components manually is loaded into carriers before shifting to another type or size.

► **Automatic Testing**—As the turret rotates, the component is subjected to electrical tests, according to instructions furnished by punch cards. If the component has multiple sections, each sec-



1. PRINTED BOARD & PALLET



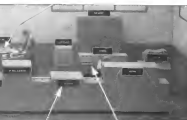
2. MAGAZINE & CARRIERS



3. COMPONENT TEST & LOADING



4. PLACEMENT HEAD



5. BOARD & COMPONENTS



tion is tested at a succeeding station in the turret advance (photo 5).

When the component carrier nears the end of the 180 deg turn at the turret, units which have passed electrical tests automatically are loaded into the same magazine from which they were captured earlier. (The magazine is later on its main turret.) When the magazine is filled, it moves out into

materially to a storage closet, and eventually to the conveyor which transports it to the component placement head.

If a component fails electrical test, it passes by the magazine loading station to another where it is automatically ejected from its carrier.

► **Pallet Loading Used**—To ease the problem of mechanized handling of a

wide variety of different size predrilled circuit boards, GE uses a metal frame (photo 1) into which the boards are manually inserted and secured (photo 1).

Barred rows of holes in the frame are predrilled.

Once installed in their pallets, the boards are fed to a storage elevator and conveyor transported to the component placement head as needed.

Batch Process—GE decided against designing ACAS for a "continuous process" in which all components would be installed on a single board in a series of movements of board and placement head.

Instead, ACAS uses what is called a "batch process," in which the head (photo 4) is positioned to install one specific component and a batch, perhaps

of boards is run through, coming out with one component on each board. The board then is changed automatically to a new position (levering 90 degrees and extracting). It is then supplied with another magazine of different components, and the boards are recycled through the machine again, coming out with two components installed on each. The boards are recycled until all the required components are on (photo 5).

The use of the batch process setup for AGAS's design is well in keeping with output. The machine can run 20 boards through one cycle in 40 seconds. Another 10 seconds is required to reload the placement head with a fresh component magazine, after which the cycle can be repeated. The printed boards are mounted through the placement cycle by means of two elevators and a conveyor system.

► **Component Positioning**—Position of the component on the printed board is established by three servo systems, from punch card commands. One of these positions the placement head in one axis (X), another locates the board-pallet in the Y direction, and the third rotates the placement head in 240-deg increments to permit angular placement of components on the board.

The placement head can handle components measuring up to 2.35x.68x.75 in., and can mount them as close as 0.02 in. to one another, if individual component pins permit, Wazzner said.

The head also can handle components with up to eight leads, such as two printed toggle circuits, consisting of a driver-comparator network.

When a loaded magazine arrives at the placement head and moves into position, the head extracts one component at a time, from the demand component from its pins, and deposits the supply carrier back to the magazine. When the magazine is filled with empty carriers, it is ejected automatically and transported back to the component preparation machine for refill.

► **Solder Refill**—When all components have been installed on a batch of printed boards, the punch card control stops the recycling, and sends them off to a dip solder bath. The boards first pass over a bluing spray of zinc and alcohol and then are positioned over the hot solder pot (photo 6).

A solder "bath," previously immersed in the pot is brought up automatically to the underside of the board, during which time the board is rotated to bring the solder into intimate contact with the parts.

The board then is rotated away from the solder bath and vibrated to remove excess solder. After a final rotation to give the solder time to solidify, the board is conveyed to the post-test storage elevator.

From here the boards pass to the

USM's Automatic Assembler



PRODUCTION of United Shoe Machinery Corp.'s system for automated placement of electronic components on printed circuit boards in a factory, following successful completion of its month's evaluation in radio-TV plants, USM says. Equipment, which reportedly can pace out more than 1,000 boards per hour, is of same general type as model developed by General Nide.



VARIETY OF COMPONENTS including inductors, capacitors, resistors, diodes and 40-type capacitors, tube sockets, and IC transistors can be installed by machine. Small components, such as resistors shown here, are fed to placement head on helical attachment to their bins. USM reports that same components can now be loaded from manufacturers in bulk form.



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automatic test station where they are checked for conformity to the component tolerances, and for possible undetected strains arising from solder blabs.

The tests do not check component tolerances (which were tested prior to solder loading) to avoid contact performance, since this would require sufficient time for component values to stabilize, delaying ACAS output. The contact dry-down tests are run at a rate of five per second.

► **The Next Step**—General Electric currently is discussing with the Signal Corps the possibility of another contract to extend the capability of ACAS beyond the original design objectives. Such a program might include:

- Tabularized component test/checkout procedures, to accommodate such devices as tube sockets, electrolytic capacitors, and transformers.
- Automatic functional testing of completed sub-assemblies.
- Automatic packaging of numbers of sub-assemblies, such as those turned out by the present ACAS, into completed electronic equipment.

ACAS, following close on the heels of ACI Industries new Project Tanker plant, General Mills' new Airtech and United Ship Machinery Corp.'s redesigned assembly section, indicates that 1955 may be the year that automation came of age in the military and electronics industry.

Experts Doubt Claim Paint Blinds Radar

A new "paint" claimed to make aircraft and missiles invisible to radar, a development which if true would revolutionize the air defense picture, has been reported by Canadian Inventive and Scientific Associates Ltd., Toronto. American Vortex acquired a top scientist at one of the USSR's main electronics centers which develops air defense radar, who reportedly would be one of the first to test of such a development. He not only had never heard of the new paint, but also, expressed strong doubts that such a technique could ever be of value, except possibly for a very few low frequency band frequencies at a leading former Navy electronics expert brought a similar answer.

Mr. John D. Lane, president of the Canadian firm, told American Vortex that the new paint for which his company has obtained non-exclusive rights was invented by two Soviet scientists. One, he said, was known to the U. S. several months ago under Defense Department sponsorship for demonstrations of the new "color blinders." Lane said the tests were successful, adding that the Canadian Government, also, is interested.

Although Lane declined to disclose



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Continental's continuing interest in its product, after the sale, makes a big reduction in the cost of plane ownership and use. Continental aircraft engines are not only built to stand their full share of punishment, but backed with the kind of service that keeps them running year after year. When major overhaul time rolls round, the owner can replace his engine with a factory-remanufactured power plant—back in 200 hours, and with factory new engine guarantee—at very low fixed cost and with virtually no stand time. Continental's Factory Remanufacturing Plan is one more in a long list of reasons underlying pilot preference for planes with Continental power.

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for already reasons which Defense Department agencies had conducted the tests, he said that he hopes to publish demonstrate the effectiveness of the new "solar blinder" paint over Conduction television action.

FILTER CENTER

► **Hope for Simpler Transponder**—A recently developed transpondering tube appears to hold considerable promise for simplifying the coding system employed in air traffic control transponders, according to William F. Curran, chairman of Ameco's Audio Electronic Engineering Committee (AEEEC). The device, called a "magnum" because it's being tested, will be discussed at the forthcoming AEEEC annual meeting in November in Washington, D.C. It was developed by Herde Berthoff, a subchannel of the Hughes Corp. New device also might permit simplification of DME system.

► **New Hughes Plan Control**—First public showing of Hughes Aircraft's inter-ception fire control system for the Avco CP-100, Model 4, was made at AEEEC exhibit during the recent AEEEC convention in New York. The equipment weighs 418 lb., occupies 15 cu ft., and uses 214 tubes.

► **Automation**—Crown-Pind-Roth General Mills and United Shoe Machinery Corp. are reported to be designing placement heads for their mechanical assembly machines which will enable them to install ACF Industries' new Transistor Transducer (Compu).



Normal Power Tubes

Normal barometer transducers of electron tubes are in stock 15 1/2 lb. by one using tube size 6881. For use with acid base power tubes of types 6881, 6882, and 6883, should be handle for easy removal. It is now in production at International Electronic Research Corp., 177 W. Magnolia Blvd., Burbank, Cal.

► **Sell Reliability**—"Is the accuracy of computer systems about the firm which will establish its military equipment will have an important sales point." This advice was offered by Maj Gen Gordon A. Blake, Director of Communications, the USAF, during RICA and IRE's recent Spring Assembly meeting in Los Angeles.

► **To-Plate Specimen-Sensitive Apparatus**—development in To-Plate micro-sensor components are sponsored jointly by Navy's Industrial Planning Division and USAF's Cambridge Research Center. In Avionics Week's Apr. 11 story (p. 58) a line was dropped and it appeared that AFSCM was not the sole sponsor.

► **Frequency Control Handbook**—A 500 page handbook on precise frequency control has been prepared by Polesky under WADC sponsorship. Handbook discusses crystals, crystal ovens, recommended design procedures for all types of crystal oscillators, and includes a variety of non-crystal oscillators. The report, RDR No. 11196, may be obtained from the Office of Technical Services, U. S. Dept. of Commerce, Washington, D. C.

Avionics Bulletin

Recently announced bulletin and catalog of interest to the avionics field include:

- **Stagnant amplifiers** for signal applications are described in Technical Paper 100, "Stagnant Amplifiers and Circuit Diagrams (TP 100)", Workshop Series (GPO, 1969), 100 pages, \$2.00.
- **Functional breakdown of avionics systems** is described in "Avionics Industry Outlook" (a publication of the Avionics Industry Association), 1969, 100 pages, \$2.00.
- **RF components** for avionics systems are described in "Avionics Industry Outlook" (a publication of the Avionics Industry Association), 1969, 100 pages, \$2.00.
- **Power supplies** for avionics systems are described in "Avionics Industry Outlook" (a publication of the Avionics Industry Association), 1969, 100 pages, \$2.00.
- **General design and use notes** for the various avionics systems are listed and shown in "Avionics Industry Outlook" (a publication of the Avionics Industry Association), 1969, 100 pages, \$2.00.
- **Double-ended amplifiers**, in a variety of configurations, suitable for broadband operation up to 20 GHz and 100 dB and 100 dB are described in a catalog listing available from the Avionics Industry Association, 1969, 100 pages, \$2.00.
- **Avionics industry** is listed in a catalog and development division describes available in the Avionics Industry Outlook (a publication of the Avionics Industry Association), 1969, 100 pages, \$2.00.
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Producing high-performance, precision-built components for the atomic energy program demanded special skills and long experience.

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This is only one part of Fairchild Engine Division's story of powerplant and equipment development. Proven in postwar production, Fairchild stands ready to provide aircraft engines, underwater weapon systems or other high-performance, precision-built products—whenever they may be required, to perform new and challenging functions.



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PRODUCTION



T41 GENERATOR SET will be mounted in glass-plastic pods under wing of C-119B firing hot bed. Cutaway shows power unit details.

Mars Turbine to Power Avionic Tests

By Irving Shaw

San Diego—The proving of high-gas engine concepts will be a major job for Solar Aircraft Co.'s Mars gas turbine drive.

One of the first projects for the small, lightweight units will be supplying auxiliary power to test the engine equipment for General's XB-70 bomber.

The Mars turbines will be mounted in pods under the wings of the Cooper C-119B. Air Force flying wing test bed (AWG 35, p. 13). About 36 Cavennin are needed with 70 more possibly planned to come into the picture later, industry sources report. It is likely that the plane's development will be changed to C-151E because of modifications.

First deliveries of the Mars auxiliary power units are scheduled for August. A-C and D-C—The Mars pods will be hung below the propeller circle, outside the prop wash. There will be two pods per plane—one at the end and one in the middle. These auxiliary power units will be tied into the aircraft electrical system, but will function solely to supply the avionic equipment under test in the plane, with no independent source of power.

Then, in connection with the C-119B, was awarded to check engine gear for the General's XB-70. The test, which electrical power already has been deemed necessary then the plane's engine equipment can provide, Avionics Work has learned.

All C-119Bs already delivered will be authorized to take the Mars turbine tests.

► To Other Plans—The application as an independent auxiliary power source,

which for checking engine gear, is a new use for the Mars.

In the Douglas C-119C Globemaster and Lockheed C-119C Super Goshawk tests, the small gas turbine has been used as a drive for supplementary electrical power in the event of main engine drive failure and during engine test periods as in landing, when the engine would be throttled back.

It also has been used on the ground for cargo handling and engine starting.

► Two Models—The two models of Mars generator sets designed for the C-119B are:

• T41-M5, which will deliver 17.5 kw dc at sea level.

• T41-M6, an ac (400-cps) unit, delivering 50 kw at sea level.

This will be operated at flight up to 25,000 ft altitude, where outputs will be 15 kw and 20 kw, respectively.

The altitude in 5,000 ft more than specified for present production C-119C and C-119C installations. The engine equivalent will have to be extended to meet the new altitude requirement.

► Other Installations—Pods for the new power unit will be subcontracted. It will be a glass-plastic reinforced plastic shell, serving as a protective air-dynamic housing. The shell will support the power unit and will house wiring and fuel lines.

Experimental Mars installations are scheduled on a Fairchild C-119B and by Robins Provo Co. on a B-27 for high-power sound propagation broadcasting service. The Robins or equivalent has been under evaluation at Wright-Patterson AFB, it is reported.

► Cleveland Tests—Up to the Mars turbine unit service on the C-119C, it was expected that 250 hr might be

a reasonable endurance span. At Solar's suggestion, 500 hr was officially set by the Air Force.

When first test results showed that in June 1956, it was found that per hour had dropped less than 2% below initially was in excellent condition, and there was negligible trouble.

About 55% of the first 40 units have reached the 500-hr mark and have been pulled for further overhaul at Solar.

An Force has put raised the overhaul time to 750 hr.

► Jupiter Air Source—Another Solar gas turbine engine—the Jupiter shaft turbine—is the subject of a development contract with USAF.

The contract for modification of the shaft configuration into a bleed air machine. The modification has been tested for starting the Alouette 171s on the Douglas B66. Solar says test results have shown satisfactorily lower starting time than previously attained with compressed air on the 171s in the bomber. Also, in a typical start, 171 turbine temperature was dropped as much as 500 F, Solar says.

However, for both these conditions, the additional cooling power derived from the high-power compressed air available with the Jupiter, Solar reports.

The 500-hp engine was originally designed for either boat propulsion or generator service, for Navy. It has a 10 axial and five centrifugal compressors to a three-stage turbine, with a single compressor coupling the compressor to the engine.

In its modified form, about 10% of the net is lost in starting.



A.F. "Ozzy" Ganges
Chief Service Manager

At Cessna Aircraft...

"Cherry Rivets have proved dependable—
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"At Cessna," says A. F. "Ozzy" Ganges, Cessna President, "we use Cherry Rivets throughout our commercial and military planes in hard-to-reach places. In fact, we find them useful in many places from fuselage control to all-steel models. Cherry Rivets have proved dependable to hard-to-get-to places."

The service manager speaks from his many years of experience in engine assembly and field service work in the aircraft industry. "For those hard spots in engine assembly—on the steel flap door hinges, on the door side and ports, attaching lead between weights in the radiator fins, installing E-cushions between the stems of gas tick marks, on the windshield, to name a few—we find Cherry Rivets are a building block—Cherry Rivets are an absolute necessity."

"And in the field," Ozzy continues, "we have a stock recommendation about them—we tell our distributors that our experience shows that Cherry's ease time and maintain the highest quality work to meet that we cannot to meet."

Both enthusiastic and blarney appeared in this case only to products of the finest quality. Townsend's Cherry Rivets have long been performing a multitude of hard fastening jobs for all segments of the aircraft industry. With many manufacturers—like Cessna Aircraft Company, Walcott, Kaman—they are a standard item in both original assembly and repair work.

Hard to use Cherry Rivets work they are installed by one man from one side of the work by a special gun which puts the rivet into the fuselage shell, secures the end on the blind side, firmly clamps the rivet in place, like the tail—on a split second. Backing is eliminated.

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ties of electricity, and Norbong feeds revolution of components which must be bonded to the metal in such cases. These are non-conductive, non-oxidizing parts. The latter have to be treated with bonding breakers or lac substances before installation of fuel valves and other parts. Exposed edges must then be varnished or chrome plated to prevent corrosion.

► **Indie Processing**—Norbong uses a series of large tanks for the indie process. Parts are cleaned from tank to tank in large shakers and wash basins. Two important rules. Parts must not touch each other, proper drainage must be maintained.



HYDRITE BATH in operation at Norbong

The steel are first cleaned in an automated Divox 506 detergent machine for 3 min. at 150°F. They are followed by a top water rinse at 150°F, then by dipping in Divox 514 deoxidant of room temperature. A cold water spray rinses follows. Then the parts are immersed for a maximum of 3 min. in Indite 14 and spray rinsed again. They emerge as radiant gold.

If shape of the part prevents thorough draining, it is lowered into a drying oven. Parts having less heat stress or other considerations are given a light oiling before the final treatment. Parts may be touched up with a brush if touch is caused in handling.

No costly voltage controls or critical heat tolerances are required. Norbong has Indite in stock by Allied Research Products, Inc., Baltimore, Md.

Chemical Etching Makes Parts Cheaper

A new chemical etching process for metal parts offers savings up to 80% over conventional drilling, reaming and blanking in precision work. The technique was developed by Chance Vought, Inc.

The method is similar to a chemical cutting process being used by North American Aviation, Inc. (AAV Mfg. Co.,

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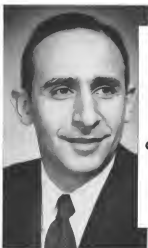
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AMATEURS ADVISORY

CHAMPION

SPARK PLUG

g. 401 "NAA" "mold" metal is controlled depth, Chance Vought states among the other stock in the demand picture.

At Chance Vought, a black-and-white market drawing at the port is transferred to the metal by photoengraving, metal lithography or silk-screen print, using a special ink or compound. Unvarnished material is then etched away by acids at approximately 0.011 in./hour. By increasing bath acid temperature 10F, etching time can be halved, the company reports.

Aluminum, copper, brass, bronze, steel, beryllium, titanium and chrome-plated sheet stock can be chemically cut without affecting their physical properties.

Chance Vought says that parts up to 0.006 in. thick can be produced with a vertical edge. It is now beating the record in a minimum thickness of 0.040 in. Parts thicker than 0.006 in. have a minute shoulder with a radius approximately equal to the depth of the cut.

Components up to 27 x 34 in. can be "Chem-Cut" with 90% of the sheet stock used effectively, compared with 75% for mechanical methods.

► Examples Among the applications of Chem-Cut metal etching at Chance Vought:



NEW AND OLD—shown in Chem-Cut etched (new) and milled (old) patterns.

► Integral air screens for powerplant air granulator of Type 503 aluminum shell strip. As originally designed, the item was made of a frame and an welded screen. Each wire had to be spot welded, a total of 216 welds. Sometimes the sparks came loose, presenting a hazard if they entered the engine.

► Reducing the construction of a copper-plate circuit without decreasing the current-carrying capacity. The circuit was Chem-Cut from flat copper sheet stock. The circuit could then be bonded between soft fiber glass cloth without post-curing treatment.

► Screens for making electronic chambers and other components are chemically etched from 0.005 in. brass sheet stock.

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LASI Tailors Aid Plan to Smaller Fleets

By George L. Christian

Two major problems facing many airlines—obtaining maximum utilization of new equipment quickly, and accurately determining costs—set the stage for several services by Lockheed Aircraft Service International at its Willowbrook facility.

To accomplish this, the airline sees the operations taken over from the airline.

• **Maintenance**
• **Operations planning and scheduling**
• **Purchasing, to a large extent**

The airline continues performing traditional maintenance, including pre-flight, taking care of flight planning, dispatching, and operating its aircraft and advertising and public relations.

Elements of the plan is underscored by figures from two of LASI's customers.

They operate only four four-engine aircraft each, and report average daily utilization of 10.15 and 9.42 hr, respectively for their fleets.

• **Merchandise Plan**—Under the plan, which LASI calls the Prime Merit Concept—and assumes the Marriage Concept—the airline is charged a flat rate per flight hour. That it can determine its total costs with great accuracy, as given at the maintenance cycle of its aircraft.

Because LASI can immediately provide the required maintenance facilities and manpower, the airline is spared the need for staffing, tooling up, and planning for its major, intermediate and major overhauls.

Thus, an airline can hire a contingent of highly-trained mechanics (personnel it does not need to maintain a crew of A&E mechanics whose skills are used only part-time, when a plane comes in for overhaul, then, when the shop goes back into operation, the crew "fills in" by accepting longer hours than the most plane comes in—and sometimes twice later.

Airline fleet reduction in maintenance hours, the airline admits these savings cost of buying mechanics on new equipment is cut, because there are few of them, tool and test equipment requirements are small; ramp and hangar space are kept to a minimum; and inventory is held down.

• **Fast Turnaround, Backup**—Because LASI provides an airline with a ready-made, fully operating maintenance department, a carrier's fleet can reach maximum utilization in a matter of



AERIAL VIEW of Lockheed's Merrill facility shows customers' aircraft parked on aprons.



HYDRAULIC SHOP isolates pressure from past for hydraulic groups and assemblies.

weeks instead of the usual years. So the carrier's leasing potential is developed in the matter of quantities, when it is especially needed—when such major expenses are incurred as paying for its equipment, setting up its rosters, stations, offices and living services provided.

LASI is now the maintenance department for three airlines—Laser Aircraft (Bogotá), (Hernández, Aeromexico), (Bogotá), (Aviation), (Bogotá), (Western Airlines). It is a member of other airlines in potential customers for the future.

Common factors which LASI says for these airlines closely tie the marriage concept are:

• All operate (or will operate) relatively small numbers of large, modern, low engine aircraft.

• All fly (or probably will fly) into New York International Airport where LASI has set up its rosters and well-equipped maintenance facility. Thus, the planes scheduled can be removed to rotate them through New York at appropriate times to go through maintenance under LASI's Equalized Service Plan, which aims to keep a plane on the ground for maintenance a maximum of 100 days, allowing maximum utilization.

Max Hubert, Commercial Sales Manager, told American Wire that under this plan an aircraft in a carrier's fleet (up to 10 planes) will be out of service



No other material could do the job.



National Seamless Tubes of USS Stainless Steel chosen for Radar Scanner Wave Guide Tube

The wave guide tube, along with the rotor control, forms the control control unit of the Radar Antenna System designed and manufactured by Davis Industries, Inc., of Detroit, Michigan.

Originally, the wave guide tube was manufactured from carbon steel suitably plated to eliminate corrosion. Manufacturing complexities and plating difficulties proved this process economically unwise and operationally hazardous. That's why NATIONAL SEAMLESS TUBES OF USS Stainless Steel were specified. The 1 1/2" I.D., 1/2" wall stainless USS Stainless Steel tubes offered a clean job that required no plating and solved the corrosion problem. In

addition, only stainless steel tubing could meet the weight and strength factors required.

The superior strength, consistent uniformity, and dimensional accuracy of NATIONAL Tube's Stainless Steel Tubing make it ideal for all types of vital applications. It is available in a wide range of diameters, wall thicknesses, various shapes and steel analysis, and is produced to exacting standards by the world's largest manufacturer of tubular steel products. Upon request, our engineers will be glad to make a study of your requirements, and help you apply Stainless Steel Tubing to your particular specifications.

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many of the new jets and turbo jets. More and more you'll see Fluoroflex-T hose assemblies specified where lines are subject to severe temperature and service conditions. Send for full information on types available.

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for more than 60 elapsed hours per 450 hours of flying.

Holst's perfect test Aircraft Performance Reports, which showed these with union figures for February 1955.

• **SEWA's** four 10-900 Super Constellation average utilization: 8.15 hr., two high phases for 10.15 and 8.30 hr. respectively.

• **Airlines** Three 10-900 Super Constellation and one 749 Constellation average utilization: 8.10 hr., two high phases for 9.42 and 9.11 hr. respectively.

• **Boards** Three 10-900 Super Constellation from a low of 4.13 to a high of 6.41 hr. Low utilization is due to the airline being a newcomer, according to LANSI spokesmen.

• **Service Breakdown**—Here is the breakdown of LANSI's on-line under its Flying Hour Concept.

• **Maintain the aircraft**, regardless of maintenance, through all overhaul cycles through major overhauls and overhauls.



INSTRUMENT SHOP

hard at 10,000 hours. This includes severe engine work, which Holst's department has proved maintenance of an aircraft's mechanical discrepancies and the accommodation of preventive maintenance is required. Not included in the contract are such services as inspecting a damaged aircraft or performing modifications.

• **Keep all operational statistics.** This includes detailed records of a fleet's utilization, including number of delays and cancellations.

• **Develop a complete up-to-date maintenance manual.**

• **Integrate parts procurement for the airline's entire fleet.** The procurement is planned on a priority basis—critical items must be on hand for the first month of operations, less critical items for the second month, and least needed items no later than the third month.

Procurement is integrated with maintenance by the airline and by LANSI. Under the contract, LANSI is authorized to purchase any part that is required, but is not in stock, to keep an airplane flying.

• **Provide spare parts inventory of all components on the aircraft.** This includes quantity of each item used per aircraft, where each item should be stocked (house, on-line station or at LANSI), whether the part should be included in the inventory list and how many of each item should be stocked at each location.

• **Establish aircraft overhaul timetable.** Based on a given utilization, the plan takes a place over the aircraft's maintenance and parts through its entire maintenance period as required by Civil Aero-

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30-15C	56	1700-4100	75-180	24	N.Y. 16-2
30-15D	56	1700-4100	75-180	24	N.Y. 16-2
30-15E	56	1700-4100	75-180	24	N.Y. 16-2
30-15F	56	1700-4100	75-180	24	N.Y. 16-2
30-15G	56	1700-4100	75-180	24	N.Y. 16-2
30-15H	56	1700-4100	75-180	24	N.Y. 16-2
30-15I	56	1700-4100	75-180	24	N.Y. 16-2
30-15J	56	1700-4100	75-180	24	N.Y. 16-2
30-15K	56	1700-4100	75-180	24	N.Y. 16-2
30-15L	56	1700-4100	75-180	24	N.Y. 16-2
30-15M	56	1700-4100	75-180	24	N.Y. 16-2
30-15N	56	1700-4100	75-180	24	N.Y. 16-2
30-15O	56	1700-4100	75-180	24	N.Y. 16-2
30-15P	56	1700-4100	75-180	24	N.Y. 16-2
30-15Q	56	1700-4100	75-180	24	N.Y. 16-2
30-15R	56	1700-4100	75-180	24	N.Y. 16-2
30-15S	56	1700-4100	75-180	24	N.Y. 16-2
30-15T	56	1700-4100	75-180	24	N.Y. 16-2
30-15U	56	1700-4100	75-180	24	N.Y. 16-2
30-15V	56	1700-4100	75-180	24	N.Y. 16-2
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Northwest Sales Office: 1275 Westlake Ave., Duluth, Calif.
General Inquiry: Bendix Division, P.O. Box 1000, Westfield, N.J.
Representative: Bendix International Division, 200 E. 42nd St., New York 17, N.Y.

Lodestar Gets New Long-Life Fuel Cells

Plastic nylon-reinforced fuel cells, reported to last for the life of an aircraft, have been installed in Cheltenham Corp.'s Lodestar aircraft.

Cost of the entire system tank at installation is \$6,215, approximately the same as a complete diesel and tank of integral tanks, a tank replaced about every three years, according to Tanco Aircraft Corp., which developed the new installation. The modification takes 15-25 working days.

The nylon-reinforced plastic fuel cells, made by Fluorocarbon T-100 Rubber Co., follow the same control specifications as the cells for the Boeing B-52. Fluorocarbon reports that USAF has required Boeing to standardize on this material for fuel cells.

The Lodestar center section bladder cell installation was worked out by Tanco at its Cranville, Tex., modification center where the prototype units went into a Fieseler Lodestar. The cells have 75 psi. less pressure than the integral-type tank, but hold more fuel than any other Lodestar center section cells, Tanco says.

The modification center is also developing an auto wing panel installation holding approximately 180 gal. This will increase Lodestar normal cruise range by about 14 hr.

C-Band Weather Radar Goes in RCA Plane

Business aircraft owners can now get Radar Corporation of America's C-Band weather radar suite through Aero-Space Systems Division, Los Angeles.

Installation of the 120A-AVG-10, for which Aero-Space is a distributor, is being made on an RCA corporate plane and on a Cessna 440. The West Coast distributor also will supply the necessary radomes through arrangements with Zenith Plastics Co.

A competitor in the turbine weather radar market, Bendix Radio Division's RUM-1 N-band system, is also available for corporate aircraft installations.

OFF THE LINE

Aircraft Trade Show will be held at New York's 60th Regiment Armory May 4-6. Sponsored by it is shaping up as the largest yet. Among exhibitors will be the Canadian government, publishing the aviation section of its 14th International Trade Fair. Information is

available from Aircraft Trade Show, Inc., Hotel McAlpin, New York 17.

Cleveland Aero Products, Inc., has established an aircraft landing gear repair and rebuilding department. Company also has a service exchange plan, under which customer receives a completely rebuilt landing gear in exchange for his own damaged gear. Cleveland Aero is FAA-approved. Address: 715 St. Clair Ave., N. E., Cleveland 14.

Walker Kilde Co. has bought Thermodyne Engineering Co., maker of hydraulic and liquid expansion switches used to detect overheat and low oil in aircraft engines and of other aircraft de-

vices. Thermodyne is the fourth company recently bought by Kilde in an expansion and diversification program.

Consolidated Diesel Electric Corp. of Canada is new firm organized to build the U.S. patent company's aircraft ground support and component testing equipment, and generator sets in Canada. Address: 14 Radnor St., Ottawa.

Eastday Silicon electronic storage batteries for the rockets and power the electronic guidance system on Falcon USAF's plane delivering remote. Six out of the eight rockets push one battery are used. The battery weighs about 1 lb. and is rated at 5 amp-hr.

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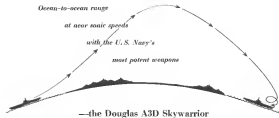
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Aircraft Radio Corp., Boston, N. J.

Stress Indicator Built in Bolt

A new type of bolt with a built-in means of checking its tensile loading assembly was revealed last week at the Society of Automotive Engineers' Aircraft Engineering Display. Its makers claim it may eliminate aircraft fastener failures caused by improper loading.

The "Ten Load" bolt has a reference gas inserted along the bolt, and is formed of its inner end at a predetermined distance from the reference point in the bolt body. When the fastener is tightened, it elongates

in proportion to the tensile stress applied. Since the reference gas is at fixed ends of one end, it does not elongate, and appears to move into the bolt head. A dual indicator measures depth of recess or strain. Since stress is proportional to strain, the indicator is calibrated to read stress directly in pounds per square inch.

By taking advantage of the naturally modulus of elasticity, Ten Load's makers say they avoid the errors inherent in use of torque wrenches for tightening bolts to a desired value. Torque varies widely, depending on lubrication, thread fit, bearing surface smoothness and plating conditions.

Another means of measuring bolt



stress is the elongation method, where the fastener's length before and after tightening is measured and the stress-strain proportionality is used to obtain



Stand Measures Jet Thrust to 100,000 Lb.

Jet engines of up to 100,000-lb. thrust can be measured by new Perma Model D stand, shown checking output of General Vought, F7U-1P's 6,800-lb. thrust Westinghouse J46. One of a variety of eppendix built mounting cells provides the strong frame. The stand also is capable of taking loads weighing up to 150,000 lb., the manufacturer claims. Most wing sections are tested to be one-half of one pound. Stands may be driven with either rack "driving" pistons (double) or Teledyne arm rods (the F7U-1P) or parallel type with flexible pistons for the arm's wheels. David Engineering Corp., Forted, Pa.

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With over a billion dollars of insurance in force, we are well aware of the risk factor in all forms of transportation. That's why we use our own company plane to transport our executives. It is a Twin Beech—powered by dependable Airwork overhauled P & WA engines.

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Millville, New Jersey

the trunion valve. This is welded and non-consuming, and also replaceable, where only one end of the bolt is accessible.

Treadload bolts can be made of any material now used for fasteners.

Precision Threaded Products Div.,
The Road Runner Co., 81 Woodbine
St., Hartford 6, Conn.

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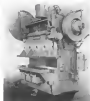
New Teflon yarn packing, designed to meet corrosion and handle higher peripheral speeds than ordinary leaded type or milled Teflon, has been developed for service on pump shafts and valve stems.

It is tightly leaded to provide density, firmness and eliminate large voids, the faster stems. When necessary it can be impregnated with fluorocarbon or other lubrication material. Stems available in sizes 1/8 to 1 1/2 in., in 1/16-in. steps.

Cover Packing Co., Dept. A/WN,
1800 Center Ave., Chicago, 11, in
Canada, 687 Paskdale Ave., North
Haven, Conn.

Press Brake for Shallow Draws

Shallow draw and other press work are handled by new shallow press brake having a 16-in. bed, max. width 15 in. draw height and eight-foot overall die length. On the left's underside, front



and back, are six 12-in. air cushions.

Equipment weighs 17 tons. An electric clutch has automatic stop and non-repeat features. Dual foot pedals operate as one or separately. They serve both for safety. Two-speed transmission operates at 11 and 30 strokes/minute.

Cincinnati Shaper Co., Hoppel, Garret & Elmer St., Cincinnati 25, Ohio.



Motor-Driven Aircraft Gas Pumps

Submersible pumps that fit inside three-and-a-half-inch gasoline pipe are designed for use in airport high-octane gasoline pumps to fuel aircraft.

Unit is flooded with gasoline, which is sent to cockpit and leaving inherent. Windings and stator core are sealed in epoxy resin. Thermostat provides motor and fan protection by decreasing power supply soon after the fuel fuel tank is pumped dry.

General Purpose Component Motor Department, General Electric Co.,
Schenectady, N. Y.

Powder-Metal Aluminum Alloys

Porosity ranging from five to 150 microns in features of aluminum and aluminum alloys made by powder metallurgy method. Finned and white, the material's chemical properties equal solid aluminum of comparable composition, the manufacturer states. Experimental quantities are available.

Metco Metals Corp., 16 Sea Cliff Ave., Glen Cove, N. Y.



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NEWS BULLETIN *Defence*

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The capabilities of the Gloster Javelin day and night fighter are a powerful deterrent against attack "knock-out" raids. The Javelin is a real "pocket plane"—tough, compact and easy to handle. It carries a two-man crew because of the complexity of its radar system which needs the attention of a full time expert. Their big nose hitting fighter solves an acute defence problem and has already given a new look to Western Europe's role in the event of trouble. Full details of this remarkable fighter are still secret. It is sufficient to say here that, free the word "go", the Javelin can be up fighting at over 50,000 ft. in a very few minutes. And that refuelling and reloading are similarly a matter of minutes. No other day and night all-weather fighter in service today has such speed or destructive firepower. No other all-weather fighter has such a proven development potential. The Javelin is made by Gloster, who made the first successful turbo-jet aircraft, (one of the remarkable successes) and of course also responsible for the Meteor fighter and the Avro Vulcan four-jet Delta-Wing bomber.

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Magnaflex Corp., 7700 W. Lancaster Ave., Chicago 14, Ill.

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WHAT'S NEW

Telling the Market

Precision metal working facilities are described in "Grand old Research Design and Production," New Process Corp. Corp., 930 Plan St., Syracuse, N. Y. The monolithic metal manufacturing and machining guide, Metals & Controls Corp., Attleboro, Mass. Industry experience with Kodograph Autographic paper for improving drawing reproduction is given in "Autographic in Action," Clough Repro-

tain Sales Division, Eastman Kodak Co., Rochester 4, N. Y.

Technical aspects and applications in Metalplate process of reproduction on selected aluminum plates, Metal plate Corp., 2003 E. 73 St., Cleveland 4, Ohio. Seventh Edition, B&N rivet tool catalog, B&N Rivet Tool Co., 8524 Bellvue Ave., Los Angeles 43, Calif. Military and industrial environmental test equipment, Hazlett Engineering Co., 1225 N. Hollywood Way, P.O. Box 140, Burbank, Calif.

Temperature isolation mounting for electronics and stationary radio

equipment, Bellco Inc., Lead Manufacturing Co., 1615 W. 12 St., Erie Pa. Vacuum shell-type Model 2705 furnace for development in small scale output, particularly titanium melting, Nitron Equipment Corp., 160 Chestnut St., Newton Highlands 6, Mass.

Ball piston hydraulic constant-speed drives are covered in operational technical Bulletin GEG-9816, General Electric Co., Apparatus Sales Division, Schenectady 5, N. Y. Buying information on ac fractional and integral motors, Bulletin GEG-9816, General Electric, Schenectady 5, N. Y. Elapsed time indicator Series HD-634 for electronic and machine tool equipment, Bulletin MHD-113, Electronic Sales Division, DeLan-Avaco Corp., 4541 Northern Blvd., Long Island City 1, N. Y.

Thermocouples and pressure accessories, Byron Gude and Dana Massey, Bulletin P-1233, Bristol Co., Waterbury 26, Conn. Stainless steel price schedule also includes K Monel, Hastelloy, Inconel X and nickel clad copper Tachafly Co., Inc., Rahway, N. J. Teflon applications, Bulletin 155, Sparta Manufacturing Co., P.O. Box 65, Elroy, Ohio. Shock and vibration isolators for machine tools, Bulletin 516, Berry Controls, Inc., 1008 Pleasant St., Woburn, Mass.

Advantages of electronic parts and level imaging and input enhancers are detailed in *Aluminum Packaging* booklet, Elcom Aluminum, 14200 S. Western Ave., Tempe, Calif.

High accuracy induction system for jet engines making 30 in. a 595, has 1,000 operating hours, Procter Sheet 126, Avco, Inc., 55-15 Northern Blvd., Woodside 77, N. Y.

Publications Received

* *Air Navigation*, 4th Revised Edition—77 p. (1) Vision-Fly by Wm. S. Jones of Navigation, Annapolis, Md. \$5.00; 475 pp.

A survey of the parallel methods of air navigation. This is a new chapter and about 50% of the book is new material.

* *Television and Radio Engineering*, Second Edition—Edited by W. MacKenzie-Pap, for the Plenum Publishing Corp., 1 West 11th St., M. Y. 16, 56 pp., 216 pp. An up-to-date guide to the principles and terminology of television and radio.

* *See's All the World's Aircraft—1954* 95th—Compiled and edited by Kenneth Hendry—Published by The McGraw-Hill Book Company, Inc., 370 West 42nd St., N. Y. 36, 315 pp., \$75 pp.

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AIR TRANSPORT ATA Urges Overhaul of Traffic Control

Arnold seeks more money to overcome problems of crowded air space; opposes funds for civil DME.

By Freda Stavis

An unbudgeted air traffic control system is blocking the progress of aviation. The problem is basic to the military as well as civil air space users.

Commercial aviation today is preparing for the jet transport era while operating upon antiquated aircraft under a traffic control system that is inadequate to meet even the present requirements for conventional civil traffic and military jet aircraft. The constantly increasing air traffic could possibly produce a breakdown in air traffic control.

Civil and military users, along with the Civil Aeronautics Administration which runs the nation's airports, are hard at work on the problem. However, they place different priorities on the needed equipment to handle the rapidly increasing flow of traffic.

Traffic Controversy

A case in point is the continuing controversy over civilian, Tacon vs civil DME in the common system for short range navigation.

The airlines and the military believe that civil DME will contribute little toward improvement of traffic control.

CAA and the advocates of civil aviation advocating continued use of civil DME contend it is an essential element.

The navigation system battle is continuing despite the recent progress outlined by the Air Cautelizing Committee in an interim solution (AW Apr. 25, p. 114). The ACC program was declared as the firm position of the executive branch of the government. It was unhesitatingly followed, however, by a strong dissent from the scheduled airlines, which was helped with Congress—the but not want perched quarter yet to be heard from.

Milton W. Arnold, Air Transport Ass'n's vice president-opposition, last week told the House Commerce subcommittee investigating the Tacon civil DME dispute that "we find it impossible to conciliate any recommendations which would result in the further expenditure of funds for the operation or maintenance of DME." He criticized the ACC's estimate of a continued use for DME until June 1960 as having two major weaknesses:

- Increasing the burden and increas-

ing threat to users, should Tacon be accepted in the common system in the near future.

- Causing the taxpayer huge sums of money without adequate justification.

The relatively large sums of money that would be spent on DME could be put to better use to improve air traffic control, Arnold told. He told the one source that equal funds "can buy as greatly needed to achieve serious air traffic control deficiencies."

Traffic Requirements

Among the requirements for which funds are needed:

- Long-range radar and an ATC radar beacon system.
- Additional communication channels.
- More controllers personnel in both centers and towers.
- Additional VOR installations.
- Air traffic control for many routes where it is needed, but not presently provided.

"Fulfilling these needs will do far more to improve air traffic control than will the expansion of civil DME at this time," Arnold said.

Meanwhile, Fred B. Lee, CAA's administrator, last week moved the ever-all problem of controlling air traffic as being narrowed down to one of two:

reg threat of its tremendously increasing volume. He said, moreover, "we don't see any lowering of the problem."

Lee told a Baltimore regional meeting of the Institute of Navigation the danger signals are there to express types in the need for new equipment and improved techniques.

CAA Studies

Two important studies Lee outlined as underway involve air route control.

- Use of existing military air defense radar by CAA controllers.
- Change to precision type display for posting acquired information from the old standard flight data strip.

Lee indicated that use of military air defense radar in one of the solutions to air route traffic problems should be possible without compromising military requirements. It would at least relieve the problem until the ultimate solution was a fully developed, he said.

The present standard flight display board, however, is the backbone of air route control and is the weakest link due to the inadequacy of posting fuel status. With the increasing traffic, the problem is to keep the position reports of air route traffic accurate and up-to-date at all times and also post sufficient data to the controller. Lee acknowledged the attention is now acquiring a change in the method of presenting all the required information.

The air route traffic problem has not



TACON ANTENNA, shown for the first time, is located at Federal Telecommunications Laboratories in Natick, N. J., where development and initial tests were conducted.

said the route stage, according to LTA, but is increasing as more jets are added by the airlines. It is also expected to increase as more jets go into long-range operations. Whether the passenger load will be the same, Lee said he didn't know.

Another conflict facing air traffic control is number of jets increase in that there is no provision in the rules for multiple approach sequences.

The system today is based on long established concept of "first come, first served." But jets cannot hold in stacks or multiple approach delays because of their high rate at which they consume fuel.

"The answer to this problem is not in sight," Lee said. "So, for the time being at least, we believe that jets will have to continue with the present system as even holding over when the special handling will not alleviate with the regular flow of traffic."

CAB Grants Irregular Flight Limit Exemption

Extraneous of the 1st flight limit for F-4s granted the scheduled routes but the last time the Civil Aeronautics Board to include irregular carriers. This clears the way for North American Airlines to start transcontinental night flying operations.

The rule for irregular carriers, as granted by North American, contains the same restrictions applied to scheduled carriers. The flights now have a 10-hr. limit and must be conducted in passenger aircraft with a crew of at least two pilots and a flight engineer.

In addition, CAB requires the irregular carrier to have an approved communication service independent of regular systems and a duplicate equipment. Both must be certified by the Civil Aeronautics Administration.

North American has announced that it wants all the regulations laid planned to start transcontinental overnight operations May 1 using DC-4s. Flights will be scheduled 7 hr., 55 min. westbound and 8 hr., 55 min. eastbound.

TWA Refunds Mail Pay

Three World Airlines refunded \$775,882.29 to the Civil Aeronautics Board in return mail payments for overseas service.

Both the international and domestic operations of TWA were unprofitable without government aid in 1954 and a profit was referred despite a record service loss for the aircraft of the company. TWA's losses were used by the department to pay the interest on the difference between payments received under temporary rates and total cost for carrier. CAB's final order an international mail rate case.

Military Use of Civil Airports Must Continue, Air Force States

Seattle—U.S. airport operators were told here last week that despite their objections military use of civil airports will continue indefinitely.

In order to avoid dangerous possession of military air bases, civil airports must absorb the overflow, Maj. Gen. Robert A. Landis, USAF, informed the meeting of the Airport Operators Council.

"I suggest we face up to that fact and its ramifications," Gen. Landis said in discussing what would be called Joint Civilian of the Port of New York meeting of the Airport Operators Council.

Many of separate laws for military and civil aviation is not possible, Landis said. And under military demands, "they are military right in court, in the best interest of the security of the country."

Shortage of suitable bases for operations Air Force estimated in the U.S., including Seattle, Air Command, Tactical Air Command and Air Defense Command is a serious USAF problem, Landis declared.

Need for bases for Reserve and Air National Guard wings also is urgent, he said. "We are doing everything we can to get Reserve and Guard wings in M-D as quickly as possible."

Meanwhile, Guards—largest reserve component—declared that military pilots are using civilian airports in violation of the law by ignoring established traffic patterns, refusing to obey tower instructions, and maintaining an uncoordinated arrival and departure schedule.

"This should be reported," Landis said.

Gen. Landis said with the military attitude was evident in one member demonstrated when he turned the aviation "complete disregard" for civil needs. Another reported that when he complained to the Air Civilian at the airport about the danger of noise takeoff and landing coming from a civil field, his comments were ignored.

Still another reported that objections to use of civil ILS facilities for B-47 training drew the answer that USAF was entitled to use federal facilities. The speaker of the house, however, report complained that the speed of military jet aircraft posed not only a control tower problem but also height of the danger of military collisions in the approach area.

"We have the three problems in our military bases," Gen. Landis pointed out. Col. Joseph B. Pryor, from the Office of the Asst. Chief of Staff,

USAF, suggested that many problems which the airport operators were stating to the military were actually caused by jet aircraft.

"You will have the same problem when civilian jets begin operating," he pointed out.

■ **Live Announcements**—Operators also were asked to military aircraft carrying live radio and other announcements on civil airports. USAF member to this.

There is little stress in having Air Guard units at part of the nation's defense if Guard plans are not approved.

He tried to answer the complaints, in addition to Gen. Landis and a large staff of USAF officers, was Navy Capt. Lawrence A. White, representing Naval air operations.

All the talk isn't young boys have gone," Capt. White argued the meeting. "They are discipline violations in security drill units." He and Navy have found it possible to work out at the local level on problems resulting from use of civilian principal airports as bases for Naval Reserve Training Command units.

Gen. Landis told the operators that while "we haven't always seen eye to eye on these airport problems," nothing is done in the way of solutions satisfactory to both sides.

CAB Approves Sale Of CAA Equipment

Approval of the purchase of the assets of California Central Airlines by Southern Airways and Allegheny Airlines was given by the Civil Aeronautics Board.

The CAB also approves a dispute which arose when Southern and Allegheny purchased California Central's equipment from a bankruptcy trustee in February for \$500,000. The court assigned the Board to offer decisions on the sale or lease an exception permitting the purchase.

Opposition to the purchase came from a group of California Central employees who asked the U.S. District Court to reverse the sale. The court affirmed the sale. Further objections were presented to the CAB by George C. Fox, an unaffiliated bidder, who said the purchase was illegal because it didn't have prior Board approval.

The CAB found that if his production in the matter. It also found that, while the court should have obtained more information on the sale in the public interest and should be approved.

A request that labor protective provisions be attached was rejected.



VERBODEN VC-147 STARTS TO CLIMB out of Boeing Airplane Co.'s hold over Seattle on its first flight. This Stratofreighter is one of two Boeing transports modified for USAF at Puget Sound for the Fair & Whiskey Assault 1700 hp, 174 midship engine.

Boeing Reasserts Ability to Deliver Jet Liner in '58

By William Goughlin

Seattle—Boeing Airplane Co. still is prepared to offer 1958 delivery of its commercial jet transport despite military orders for jet tanker production.

Company officials said last week that military production schedules now being set up will allow sufficient excess capacity to handle commercial orders for the 707 jet transport.

Details still have to be worked out with the Air Force on commercial deliveries of the Boeing Stratofreighter, according to Ralph Bell, director of commercial sales.

But another Boeing source said it has been understood from the beginning that the company would be allowed to offer a commercial version simultaneously with an USAF jet tanker order.

This conflicts with earlier reports that Air Force Secretary Tamm and SAC Gen. Curtis LeMay might demand the full Boeing production (AWM Nov. 7, p. 15). USAF order calls for 257 tankers.

"After all, it is to the benefit of the Air Force to have a jet transport in production," Bell told Associated Press. "USAF will benefit not only from a stronger commercial jet fleet but also from an improved aircraft and lower costs."

Bell would not comment on progress of airline negotiations but Boeing officials are confident an order will be placed before the year is out. Top Air Force American World Airways officials have been among recent visitors to the Boeing plant.

Prototype Modifications

Boeing's jet prototype, with more than 150 flight hours behind it, was grounded last week for overhaul and modifications. It is scheduled to return to flight status shortly.

The company revealed that a high speed structure has been placed on the prototype as the result of control deficiencies in the previous design. These deficiencies were attributed to erroneous, large moments but were

labeled as "minor" in flight test officials.

A larger order earlier has been submitted on the prototype to account the trouble. Larger flaps have been installed and changes have been made in the aircraft's spoiler system.

Initial work on an assembly, has for the KC-135 tanker version of the Boeing 707 already in underway at the company's Renton, Wash., plant where production of the KC-97 will be phased out.

Transport Operations

According to Boeing Vice President William E. Bell, flight testing at the 707 has shown that the jet transport will be able to operate satisfactorily in the air and on the ground in the same pattern in today's commercial aircraft.

He said the jet transport will be able to use ground ramps, take off from the same airfield as regular transport aircraft and so shift in approach as takeoff angles.

"No changes are necessary to justify 707 service," Bell declared.

Boeing's commercial jet will be successful in approaching airports in short as 500 yards, Bell said. Present configurations call for an airport which will carry approximately 100 passengers and 2,000 pounds of cargo in addition to passenger baggage. Passengers would disembark and depart through both low and off deck doors. Three additional exits would be available.

For international operations, takeoff weight at high as 115,000 pounds is anticipated according to D. W. Farley,

chief of preliminary design. Airlines will be offered single point or multiple point takeoff systems as desired. Four commercial flights leave New York to San Francisco with full pay load will require estimated 9,000 gallons of fuel.

Since the four-wheel tracks of the jet transport will rest on the ground, the landing gear of previous aircraft the jets will require 175 ft. separation at passenger loading ramps, according to the Boeing design chief. Crowding thus controlled will be offset by the plane's greater passenger capacity, Farley noted.

Boeing regards service through a "test" for jet transport, Farley said, adding that Boeing's service team design is expected to be available for the 707 in the case it is introduced into airline service.

EAL, Capital Sell DC-4s to Syndicate

Eastern Air Lines and Capital Airlines have sold 15 DC-4s in anticipation of delivery of new aircraft.

Eastern sold six of 10 DC-4s to a syndicate, Aero Lease, Inc., for a reported \$5 million. The deal included spare parts, equipment and K3000-TM2 engines.

The new carrier found five of the aircraft back to Eastern for a year. The other five were loaned to various operating companies.

Aero Lease, Inc., is headed by André de St. Pierre, formerly of Columbia Eastern Airways, and Stanley Weiss of North American Airlines.

Capital has sold five of its DC-4s to a group of California interstate operators. Three of the aircraft will go to Los Angeles Air Service, one to Gates Co., Inc., and one to Los Eilen, Inc. Delivery of the five DC-4s will be tied in with delivery of new Viscounts to Capital.

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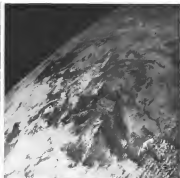
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American Airlines Offers No-Show Proposal

The no-show problem is one of the air transport industry's most vexing problems. This week the Air Traffic Conference meeting in Boston is considering solutions to this problem that will ease the airline's economic problems without risking the time valuable for airline passengers. With the tremendous growth of airline traffic during the first quarter of 1955 and signs of the biggest summer air travel boom in history just ahead, airlines can't solve this problem too soon to suit the traveling public as their own economic experts.

There is no question that no-shows are a serious drain on airline revenues. An Air Traffic Conference survey of all reservations on a typical four-carrier route segment during the week of May 9-15 in 1954 revealed 30.6% of the total passengers included in the survey either no-showed, missed connections or were no-shows. This represented 45% of all passengers who actually flew during the study period. Other surveys showed that on typical routes two passengers made reservations for every one that actually flew. With steadily increasing pressure from the public for seats, airlines cannot afford to let empty seats while rejecting revenue passengers because of the no-show confusion.

Airlines turned to the non-refundable rule as a possible solution to this problem. Experience indicated that this made no real dent in the no-show volume while providing an absolute that wore thin the patience and good will of regular air travelers toward airlines that practiced it. Despite a strong effort to sell air travel to the public on reconfirmation, this policy did little except confuse and irritate the flying public. American Airlines took the lead in a campaign to repeal reconfirmation. Its position was endorsed by a 71 to 10 final vote of Air Traffic Conference members. The airline device is now scheduled to expire June 15.

The opinion of airline traffic experts is that the reconfirmation rule failed because it resulted in inconvenience for paying passengers. It put the onus on the passenger who actually flew and not on the no-show who didn't fly. It offered no incentive for airlines to improve their reservations and traffic procedures. In a recent letter to the Air Traffic Conference members after the vote rejecting reconfirmation, C. B. Spens, American Airlines senior vice president for sales, wrote: "If we put our heads together in the Air Traffic Conference, I feel confident we can solve this no-show problem in an intelligent, cooperative and thoughtful manner." To support this attitude, American Airlines proposed a general no-show penalty charge similar to that now effective on aircraft flights. This calls for a 20% fine for a no-show with a five dollar maximum charge. In offering this proposal, American stressed three points:

- It has reduced no-show on aircraft flights.
- It has been very successful on European airlines.
- It appears logical to airline passengers who face the same type of penalty for no-show of other type tickets without adequate cancellations such as theater and sporting event tickets.
- It catches the glibness no-show mentality and does not

affect the requests of passengers who use their tickets.

American Airlines took the lead in attempting to find a workable solution to the no-show problem. Its proposal certainly deserves serious study and consideration by the Air Traffic Conference meeting in Boston. American has made it clear that it will welcome any support from any other airline proposals that will solve this problem to the satisfaction of both the traveling public and airline executives.

We agree with American Airlines that the air transport industry has in general neglected to solve this vital economic problem in a manner that will best serve the interests and convenience of the traveling public as well as play the cards that are drawing traffic revenue. With the biggest year in airline traffic history already getting a severe strain on existing seat capacity, airlines cannot afford to delay in tackling and solving the no-show problem.

USAF Auto Crash Research

Air Research and Development Command is engaged in a project at Holloman AFB, N. M., that promises far-reaching results interesting to everybody who drives or rides in automobiles. Under the direction of Col. John P. Stapp, known for his aggressive and brilliant test research, and Maj. Joseph Michalski, a former college automotive professor, ARDC is expanding its crash deceleration program, originally begun in Col. Stapp on the Northrop high speed research sleds to devise better protection for aircraft pilots, to include protection for automobile occupants during crashes.

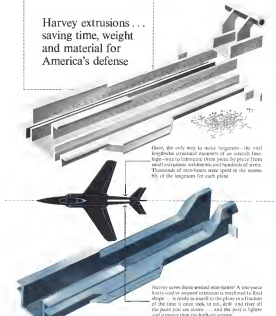
USAF has a selfish interest in the project because 678 Air Force men were killed in auto crashes last year compared with 700 killed in aircraft accidents. In addition, USAF lost 112,179 man days through automobile injuries and 5,612 service men suffered disabling injuries in cars. However, results of the USAF project will be available to the automobile industry and the public. So far the automobile industry has shown little interest in the project, but we expect the public that contributed 36,300 highway deaths in 1954 will be greatly concerned.

The Holloman project will use some test USAF can containing heavily instrumented anthropomorphic dummies that are simulated many human reactions to deceleration. These loaded cans will be crashed into barriers at speeds up to 60 mph. These experiments will add more useful information to the encyclopedia of human deceleration forces that is one of Col. Stapp's major works in progress.

Like the people engaged in aircraft crash injury research, Col. Stapp and Maj. Michalski believe that the death and injury toll from car crashes can be substantially reduced by this application of proper protective devices. Although USAF has a major self-interest in the project, it deserves a solid vote of thanks from the automobile riding public that stands to benefit from improved highway safety.

—Robert Holt

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